United States Court of Appeals
for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

227

FOR MR. JUSTICE HITZ

TRANSCRIPT OF RECORD

Court of Appeals of the District of Columbia

APRIL TERM, 1930

No. 5300

927

MARCUS T. LOTHROP AND THE TIMKEN ROLLER BEARING COMPANY, APPELLANTS,

vs.

THOMAS E. ROBERTSON, COMMISSIONER OF PATENTS.

APPEAL FROM THE SUPREME COURT OF THE DISTRICT OF COLUMBIA.

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Court of Appeals of the District of Columbia

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Court of Appeals of the District of Columbia

No. 5300.

Marcus T. Lothrop and The Timken Roller Bearing Company, Appellants,

vs.

Thomas E. Robertson, Commissioner of Patents.

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a Supreme Court of the District of Columbia

In Equity

No. 48859.

Marcus T. Lothrop and The Timken Roller Bearing Company, Plaintiffs,

vs.

Thomas E. Robertson, Commissioner of Patents, Defendant.

United States of America,
District of Columbia, ss:

Be it remembered, that in the Supreme Court of the District of Columbia, at the City of Washington, in said District, at the times hereinafter mentioned, the following papers were filled and proceedings had, in the above-entitled cause, to wit:

1 *Bill.*

Filed Sep. 25, 1928.

In the Supreme Court of the District of Columbia.

In Equity.

No. 48859.

Marcus T. Lothrop and The Timken Roller Bearing Company, Plaintiffs,

vs.

Thomas E. Robertson, Commissioner of Patents, Defendant.

To the Supreme Court of the District of Columbia:

Plaintiffs state as follows:

1. The plaintiff, Marcus T. Lothrop is a citizen of the United States and a resident of the city of Canton and state of Ohio and brings this suit in his own right; and the plaintiff, The Timken Roller Bearing Company, is a corporation organized and existing under the laws of the state of Ohio and having its principal office and place of business in the city of Canton and state of Ohio, and brings this suit in its own right.

2. Defendant, Thomas E. Robertson, is a citizen of the United States, is Commissioner of Patents of the United States and a resident of the District of Columbia, and is sued as Commissioner of Patents.

3. This is a case arising under the patent laws of the United States and particularly under section 4915 of the revised statutes of the United States as amended by Act of Congress approved March 2nd, 1927.

4. On and prior to the 28th day of July 1921, Marcus T. Lothrop was the original, first and sole inventor of a certain Process of Making Conical Rollers which is fully set forth and described in the specifications and drawings forming part of his application for letters patent
2 therefor filed in the Patent Office July 28, 1921 and bearing Serial Number 488,260; that said process had

not been known or used before his invention or discovery thereof or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to said application, or patented in any country foreign to the United States on an application filed more than twelve months before said application, or in public use or on sale in the United States for more than two years prior to said application; and that no application for patent on said invention had been filed by him or his legal representatives or assigns in any country foreign to the United States and that said invention had not been abandoned.

5. Being the original, first and sole inventor of said Process of Making Conical Rollers, said Lothrop was legally entitled to letters patent therefor, and on the 28th day of July, 1921, made application Serial Number 488,260 for letters patent therefor, in writing, to the Commissioner of Patents and filed in the Patent Office a written description of said process and his claims therefor and complied with all the requirements of the statutes of the United States in such cases made and provided, all as will fully appear by said application Serial Number 488,260 on file in the Patent Office or by a duly authenticated copy thereof hereto annexed marked Exhibit A and made part thereof; that thereafter the original claims of said application were amended in conformity with the statutes and rules of the Patent Office and, as amended, said claims particularly point out and distinctly claim the invention of said Lothrop for which he was legally entitled to letters patent and are as follows, namely:

3 “1. The improvement in the art of making conical rollers which consists in progressively coining a slug in a series of dies of which the last is of the size and taper desired for the roller.

2. The process of making conical rollers which consists in coining a slug of substantially the same volume as the finished roller in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and carburizing and hardening said green roller.

3. The process of making conical rollers which consists in coining a slug in a conical die or dies to form a green

roller of approximately the size and shape desired for the finished roller and with centering depressions in its opposite ends concentric with the axis thereof, carburizing and hardening said roller, mounting it on centering spindles entered into the end depressions thereof and grinding the surface thereof while thus centered.

4. The process of making conical rollers which consists in coining in a conical die or dies a slug of substantially the same volume as the finished roller to form a green roller of approximately the size and shape desired for the finished roller and with its ends adapted to cooperate in centering said roller in a grinding machine, carburizing and hardening said roller, centering it in a grinding machine and grinding the surface thereof while thus centered.

6. The improvement in the art of making headless conical rollers which consists in placing a slug of the volume required for the roller inside a conical die whose bore is of simple conical form and upsetting the slug against the wall of said conical bore of said die, the plunger and knockout members that cooperate with said die each having a conical projection adapted to form an axial conical recess in an end of the roller.

7. The process of making conical rollers for roller bearings which comprises shortening and thickening a cylindrical slug of substantially the same volume as the finished roller by pressure against the ends thereof while in a conical die of the size and taper of such roller.

8. The process of making conical rollers for roller bearings which comprises the coining of a cylindrical slug of substantially the same volume as the finished roller into a blank whose side surface has substantially the same taper throughout the greater portion of its length as the finished roller, inserting the greater portion of said blank into a conical coining die whose side wall is of the same length, diameter and taper as the side surface of such finished article, and pressing said blank endwise to shorten it and spread it sidewise against the side wall of said conical die throughout the full depth of said side wall.

4 9. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in

cooperating dies, of which one member has a conical bore of such length that the larger end of the upset slug projects slightly therefrom, and the second member has a radiused shallow recess of the same diameter as the large end of said conical bore.

10. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one member has a conical bore of greater diameter than the slug and of such length that the larger end of the upset slug projects endwise slightly therefrom, and the second member has a radiused shallow recess of the same diameter as the large end of said bore of the same volume as said projecting portion.

11. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of steel of the same volume as the roller to be produced in a die member with a conical bore of such length that the larger end of the upset slug projects endwise slightly therefrom, such upsetting being effected by means of a plunger with a shallow radiused recess of the same diameter as the large end of said conical bore.

12. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one set comprises a member with a bore whose bottom edge is radiused and which is conical from said edge throughout the greater portion of its length, said bore being of greater diameter than the slug throughout the greater portion of its length and of such length that the larger end of the upset slug projects slightly therefrom, and a second member with a cylindrical bore with a flaring edge in which works a cylindrical plunger whose forward stroke carries its front edge flush with the end of the cylindrical portion of said bore, and a second set of which one member has a bore which is continuously conical from the larger end thereof to the radiused bottom edge thereof, said bore being of the same taper as the product, and a second member with a dished recess of the same diameter as the larger end of said conical bore.

13. The improvement in the art of making conical rollers which consists in forging a slug in a conical die or dies

to form a green roller of approximately the size and shape desired for the finished roller and with centering depressions in its opposite ends concentric with the axis thereof, mounting it on centering spindles entered into the end depressions thereof and finishing the surface thereof while thus centered.

5 6. Thereafter such proceedings were had upon said application Serial Number 488,260 that, on June 10, 1927, said application and all the claims thereof amended as aforesaid were finally rejected by the Primary Examiner of the Patent Office in charge thereof; thereafter, and within the time allowed by law for the purpose plaintiffs appealed from said decision of the Primary Examiner to the Board of Appeals of the Patent Office, and thereafter such proceedings were had upon said appeal that on April 23, 1928, said Board of Appeals rendered its decision whereby it affirmed the decision of the Primary Examiner and rejected said application for patent and all of the claims thereof which claims are hereinbefore quoted, and in consequence of said decision of said Board of Appeals, a patent on said application was refused by the Commissioner of Patents on April 23, 1928. No appeal was taken from the decision of said Board of Appeals to the Court of Appeals of the District of Columbia and the time within which such an appeal might have been taken has expired. There are no adverse or opposing parties.

7. By an instrument in writing duly signed and acknowledged before a notary public on July 22, 1921, and recorded in the Patent Office on the 28th day of July, 1921, in Liber E 113 Page 475 of Assignments of Patents, said Lothrop sold, assigned and conveyed to said plaintiff, The Timken Roller Bearing Company, the entire right, title and interest in and to said invention and in and to the letters patent to be obtained therefor, whereby said The Timken Roller Bearing Company became and ever since has been and still is the owner of said invention, namely, said Process of Making Conical Rollers and of said application Serial number 488,260 for letters patent there-
6 for, and the prosecution of said application and of this suit has been and is for its sole benefit and use.

8. On and prior to the 20th day of January 1922, Marcus T. Lothrop was the original, first and sole inventor of a

certain Improvement in Rollers for Roller Bearings which is fully set forth and described in the specifications and drawings forming part of his application for letters patent therefor filed in the Patent Office January 20, 1922 and bearing Serial Number 530,643; and that said Improvement in Rollers for Roller Bearings had not been known or used before his invention or discovery thereof or patented or described in any printed publication in any country before his invention or discovery thereof, -or more than two years prior to said application, or patented in any country foreign to the United States on an application filed more than twelve months before said application, or in public use or on sale in the United States for more than two. years prior to said application; and that no application for patent on said invention had been filed by him or his legal representatives or assigns in any country foreign to the United States, and that said invention had not been abandoned.

9. Being the original, first and sole inventor of said Improvement in Rollers for Roller Bearings, said Lothrop was legally entitled to letters patent therefor, and said Lothrop, on the 20th day of January 1922, made application Serial Number 530,643 for letters patent therefor, in writing, to the Commissioner of Patents and filed in the Patent Office a written description of said Improvement in Rollers for Roller Bearings and his claims therefor and complied with all the requirements of the statutes of the United States in such cases made and provided, all as will fully appear by said application Serial Number
7 530,643 on file in the Patent Office or by a duly authenticated copy thereof hereto annexed marked Exhibit B and made part hereof; that thereafter the original claims of said application were amended in conformity with the statutes and rules of the Patent Office and, as amended, said claims particularly point out and distinctly claim the invention of said Lothrop for which he was legally entitled to letters patent and are as follows, namely:

“1. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a forming die.

2. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a

forming die whereby all points of the bearing surface are concentric with the axis.

3. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends and having a radiused edge at each end inside a forming die, the radiused edges in the finished article retaining the characteristic appearance of upset metal.

4. A die-formed roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, said roller being case-hardened and having its main bearing surface free from marks of finishing tools, whereby the entire case resulting from the hardening operation is preserved in the finished roller.

5. A die formed roller having axial recesses formed in the ends thereof during the dieing operation, one or both of said recesses having a rim portion whose inner surface is adapted for frictional cooperation with the driving center of a lathe or the like.

6. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like.

7. A die-formed roller consisting of a slug upset endwise throughout its length and axially recessed in its ends, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like.

8 8. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like, and the other recess having a similar band adapted for cooperation with the idler center of such lathe.

9. A roller consisting of a high carbon steel slug upset endwise throughout its length inside a forming die, and

having axial recesses formed in its ends during the dieing operation.

10. A die-formed roller for roller bearings having axial depressions formed in its ends during the dieing operation, the rim portion of one or both of said depressions comprising a narrow band concentric with the bearing surface of said roller and of steeper inclination to the axis of said roller than the surface of the portion of said recess inside of said band, whereby said band is adapted for cooperation with a lathe center or the like.

11. A die-formed roller having depressions formed in its ends during the dieing operation, one or both of said depressions having the surface of its rim portion in the form of a frusto-conical band adapted for frictional cooperation with the center of a lathe or the like to be driven frictionally thereby, and the surface of said depression inside of said band having a lower inclination with reference to the axis of the roller than said band.

12. A roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth.

13. A taper roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth.

14. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having marks as and for the purposes set forth.

15. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having radially disposed marks as and for the purposes set forth.

9 16. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having equally spaced identification marks as and for the purposes set forth.

17. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands

concentric with the axis of the roller and said rim portion or portions having identification marks as and for the purposes set forth.

18. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and characterized by having a radiused edge at the end, said edge having the appearance of cold-upset metal.

19. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and characterized by having a radiused edge at each end, said edges having the appearance of cold-upset metal.

20. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, one end of said roller having a conical portion adapted to coöperate with the rib of a bearing cone and said roller having a radiused edge between said conical portion of the end and the bearing surface of the roller, said radiused edge preserving the appearance of upset metal.

10. Thereafter such proceedings were had upon said application Serial No. 530,643 that, on January 7, 1926, said application and all of the claims thereof, amended as aforesaid, were finally rejected by the Primary Examiner of the Patent Office in charge thereof; thereafter, and within the time allowed by law for the purpose, plaintiffs appealed from said decision of the Primary Examiner to the Board of Appeals of the Patent Office and thereafter such proceedings were had upon said appeal that on April 23, 1928, said Board of Appeals rendered its decision whereby it affirmed the decision of the Primary Examiner and rejected said application for patent and all of the claims thereof which claims are quoted in the last preceding paragraph hereof, and in consequence of said decision of said Board of Appeals, a patent on said application Serial No. 530,643
was refused by the Commissioner of Patents on
10 April 23, 1928. No appeal was taken from the de-
cision of said Board of Appeals to the Court of Appeals of the District of Columbia and the time within which such an appeal might have been taken has expired; and there are no adverse or opposing parties.

11. By an instrument in writing duly signed and acknowledged before a notary public on January 16, 1922, and recorded in the Patent Office on the 20th day of Jan-

uary 1922, in Liber E 115 Page 120 of Assignments of Patents, said Lothrop sold, assigned and conveyed to said plaintiff, The Timken Roller Bearing Company, the entire right, title and interest in and to said Improvement in Rollers for Roller Bearings set forth in said application Serial Number 530,643 and in and to the letters patent to be obtained therefor, whereby said The Timken Roller Bearing Company became and ever since has been and still is the owner of said invention and of said application Serial Number 530,643 for letters patent therefor, and the prosecution of said application and of this suit has been and is for its sole benefit and use.

12. Plaintiffs are willing and hereby offer to pay all expenses of this suit as and when ascertained by this Honorable Court, and any and all lawful fees and charges arising from or incident to said applications and the issue of letters patent thereon.

13. The Process of Making Conical Rollers set forth and claimed in said application Serial Number 488,260 and the Improvement in Rollers for Roller Bearings set forth and claimed in certain of the claims of said application Serial Number 530,643 are intimately related and mutually dependent, said roller being a product of said process;
11 and on account of this intimate relation of the process of the first application and the roller of the second application, the Primary Examiner of the Patent Office held, to the great prejudice of plaintiffs, that said process and said product constituted a single invention and ought to have been presented in a single application. Plaintiffs are willing and hereby offer to consolidate said applications into a single application, and they pray that this Honorable Court decide and decree upon the evidence to be adduced at the trial whether said applications should be kept separate and separate patents issued thereon or whether they should be consolidated into a single application and a single patent issued on such consolidated application.

14. Wherefore plaintiffs pray that a copy of this bill of complaint be served on said defendant, Thomas E. Robertson, Commissioner of Patents, together with a writ of subpœna ad respondendum issuing out of and under the seal of this Honorable Court requiring him to appear and make

answer to this bill of complaint and to perform and abide by such order and decree herein as to this court shall seem meet.

Plaintiffs further pray for a decree of this court adjudging that plaintiff Lothrop was the original, first and sole inventor of the inventions set forth in the claims of said patent applications Serial Number 488,260 and Serial Number 530,643 hereinbefore quoted and entitled according to law to letters patent therefor, that said Lothrop sold, assigned and conveyed his entire right, title and interest in and to said inventions to plaintiff, The Timken Roller Bearing Company and that plaintiff, The Timken Roller
12 Bearing Company, as assignee of the entire right,
title and interest of said Lothrop in and to said inventions, is entitled, according to law, to receive letters patent for said inventions, respectively, as specified in the claims of said applications hereinbefore set forth or for such parts thereof as by the facts in the case may appear.

MARCUS T. LOTHROP,
THE TIMKEN ROLLER BEARING COMPANY,
By MARCUS T. LOTHROP,
Vice President.

SAMUEL HERRICK
JAMES A. CARR
JOSEPH J. GRAVELY
Attorneys for Plaintiff.

STATE OF OHIO,
County of Stark, ss:

Marcus T. Lothrop being duly sworn deposes and says: I am one of the plaintiffs in the foregoing bill of complaint. I have read said bill of complaint and the contents thereof and verily believe the facts stated therein to be true.

MARCUS T. LOTHROP.

Subscribed and sworn to before me this 4th day of September, 1928. My commission expires: —— —, ——.

[SEAL.]
J. A. RILEY,
Notary Public.

My commission expires January 29, 1929.

13 EXHIBIT A TO BILL OF COMPLAINT

Department of Commerce, United States Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the Petition, Specification, Oath and Drawing, as originally filed; and Face of the File Wrapper, in the matter of the Pending Application of Marcus T. Lothrop. Filed July 28, 1921. Serial Number 488,260, for Improvement in Process of Making Conical Rollers.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twenty-fourth day of August in the year of our Lord, one thousand nine hundred and twenty-eight and of the Independence of the United States of America the one hundred and fifty-third.

[SEAL.] THOMAS E. ROBERTSON,
Commissioner of Patents.

Attest:
WILLIS B. MAGRUDER,
Chief of Division.

14 Mail Room, Jul. 28, 1921. U. S. Patent Office.

Petition.

To the Commissioner of Patents.

Your petitioner, Marcus T. Lothrop, a citizen of the United States, and a resident of the city of Canton, in the county of Stark and State of Ohio, whose post-office address is care of The Timken Roller Bearing Company, Canton, Ohio, prays that letters patent may be granted to him for the improvement in Process of Making Conical Rollers set forth in the annexed specification.

And he hereby appoints Carr & Carr (a firm composed of James A. Carr and T. Percy Carr, of Boatmen's Bank Building, St. Louis, Missouri) his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent and to transact all business in the Patent Office connected therewith.

MARCUS T. LOTHROP.

Revenue stamp.

Canton, Ohio, July 22, 1921.

15 *Specification.*

To all whom it may concern:

Be it known that I, Marcus T. Lothrop, a citizen of the United States, and a resident of the city of Canton, in the county of Stark and State of Ohio, have invented a new and useful improvement in Process of Making Conical Rollers, of which the following is a specification.

My invention relates to the manufacture of conical or taper rollers for use in conical antifriction bearings. Heretofore the common practice in making such rollers has been to start with a rod of larger diameter than that required for the finished roller and to operate thereon with a screw machine to form a green roller with a button on the end thereof, then carburize the green roller, then harden the same, then grind the surface thereof, and then remove the button that was initially formed on the end of the roller for the purpose of cooperating with the grinding mechanism. In such old process, the rod that constitutes the stock, is mounted in a lathe or screw machine and the portion near the end thereof is cut down to a conical form of proper length and taper but of slightly greater diameter than required for the finished roller, leaving, however, the endmost portion projecting from the conical portion to form a button for the purpose of fitting into the collect of the grinding machine, the head of the button being separated from the conical portion by a small neck design to be broken
after the grinding operation. This conical portion
16 constitutes the green roller; and such green roller,
with the button integral therewith, is carburized and case-hardened and then mounted in a grinding machine, which grinds the conical surface thereof to the proper diameter and taper. During this last operation, the button is

seated in the collet of the grinding machine to insure the proper concentricity of the roller; and after the button has performed this function, it is separated from the roller by breaking the neck. The foregoing process, which is the one commonly practiced, has certain disadvantages which it is the object of the present invention to avoid. Among such disadvantages are the fact that a considerable portion of the stock is wasted by reason of the necessity for starting with stock of larger diameter than the diameter of the finished product and by reason of the necessity for forming the centering button for cooperation with the collet of the grinder, and the necessity for forming a neck narrow enough to be readily broken off after the grinding operation; another disadvantage is that the work on the screw machine is considerable and expensive; and in addition to such waste and expense, the surface of the green rod is likely to be less smooth and sound and require more grinding than with my process.

The principal object of my invention is to devise an economical process of making bearing rollers of superior quality; and the invention consists principally in upsetting a
suitable slug in a tapered die or dies to produce a
17 green roller of substantially the size and taper de-
sired and with depressions in its opposite ends suitable for centering said roller in the grinding machine. It also consists in the steps and operations hereinafter described.

In the accompanying drawing, wherein like reference numerals refer to like parts wherever they occur.

Fig. 1 is a side view of the cylindrical metal rod that constitutes the stock from which the metal slugs are cut, a clug comprising a short section of said rod being shown separated therefrom;

Fig. 2 is a central longitudinal section through the forming dies used in the initial upsetting operation, a slug being shown positioned therein;

Fig. 3 is a similar section through said dies showing the slug after it has been engaged by said dies and converted into a partially tapered blank;

Fig. 4 is a central longitudinal section through the forming dies used in the second upsetting operation, the blank formed in the initial upsetting operation being shown positioned therein;

Fig. 5 is a similar section through said dies showing the blank after it has been engaged by said dies and converted into a green roller; and

Fig. 6 is a diagrammatic view illustrating the grinding operation and showing the hardened roller centered on the head and tail stocks of the grinding machine.

According to my present invention, I start with a substantially cylindrical "slug" 6 of suitable metal, such as
18 steel of such composition that it can be made to flow
plastically when cold. The "slug" is preferably a short section cut from a metal rod 7 and is of slightly less diameter than that required for the finished roller 8 but of slightly greater length; that is, the volume of the slug is approximately equal to the volume of the finished roller, except that a very slight allowance is usually made for grinding. This slug is placed in the cylindrical bore of the lower die member 9 and is upset in the partly cylindrical and partly tapered bore of the vertically movable upper die member 10 by pressure exerted on the bottom end thereof by the plunger 11 of the lower die member, whereby the slug is shortened endwise and spread laterally to conform to the surface of the bore of the upper die member and is converted into a blank 12 having a cylindrical base portion and a conical upper portion. At the same time, a central depression 13 is formed in the lower end of the blank by an accurately centered projection 14 on the upper face of the plunger 11. In order to avoid the dangers of excessive internal stresses arising from too rapid change in the form of the slug, it is desirable to divide the operation of upsetting into two or more stages performed in different dies.

When the depressions in the ends of the rollers are formed by the upsetting operations the upper die member 10 used in the initial upsetting operation has preferably the same taper as that of the plunger die 15 in which the second upsetting operation is effected, the taper of the bores in both of said die members 10 and 15 being the same
19 as desired for the finished product. The diameter
of the bore in the die member 15 is slightly larger

than the diameter of the bore in the plunger die 10, whereby the blank 12 produced in the first operation is adapted to readily fit the larger bore in the die member 15. By this arrangement, the first upsetting operation spreads the metal of the slug against the sides of the first die member 10 and thus converts the cylindrical slug 6 into a blank 12 whose length is less than that of the slug and whose diameter is greater at the thick end and less at the thin end than the corresponding dimensions of the slug. This tapered blank is removed from the first die member 10 by means of a knock-out piece 17 commonly used therewith and placed on the conical seat 18 of the lower die member 19 used in the second operation. The blank is then upset to its finished form by pressure exerted on the top end thereof by means of the plunger die 15 and the knock-out piece 20 thereof, which piece is provided with a projection 21 adapted to form a centering depression 22 in the upper or smaller end of the roller.

During the upsetting operations, centering depressions are formed in the ends of the green roller. It is convenient to form the centering depression 13 in the thicker end of the roller during the first upsetting operation by means of a suitable projection 14 on the plunger 11, leaving the centering depression 22 in the smaller end of the roller to be formed during the second upsetting operation by means of a conical projection 21 in the seat of the upper die member 15, or on the knock-out piece 20 commonly used therewith. As the centering depressions 13 and 22 are intended for cooperation with the head and tail stocks of the grinding machine, they should be formed accurately concentric with the longitudinal axis of the roller and should be coned or flared to make them self-centering on such head and tail stocks.

The green rollers 23 produced by the upsetting operation are carburized and hardened in well known manner and are then ready for grinding. By reason of the centering depressions 13 and 22 formed therein during the upsetting operations, it is a very simple and easy matter to mount the finished rollers 8 on the head and tail stocks 24 and 25 of the grinding machine on which they center themselves accurately, thus facilitating the operation of grinding them by means of a grinding wheel 26. This feature of self-centering is of great importance, as it produces greater accuracy than is easily obtainable by the present practice and therefore it reduces to a minimum the amount of grinding required for finishing the roller.

Among the advantages of the present invention are the following: it avoids waste of metal by utilizing all of the metal of the slug; it avoids the expensive operation of cutting the stock with a screw machine or the like; it assures great accuracy of centering of the rollers for the grinding operation; it reduces the losses due to unsound or imperfect surfaces; and, in general, it is more economical than the commonly used process and produces a superior article.

21 Obviously the treatment of the green rollers admits of considerable variation without departing from my invention which is mainly characterized by the making of the green rollers by upsetting slugs against the walls thereof; and I do not wish to be limited to any specific treatment of the green rollers.

22 What I claim is:

1. The improvement in the art of making conical rollers which consists in placing in a conical die of the taper required for the roller, a slug of the volume required for the roller, and upsetting said slug against the wall of said die.

2. The improvement in the art of making conical rollers which consists in progressively upsetting a slug in a series of dies of which the last is of the size and taper desired for the roller.

3. The process of making conical rollers which consists in upsetting a slug of substantially the same volume as the finished roller in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and carburizing and hardening said green roller.

4. The process of making conical rollers which consists in upsetting a slug in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and with centering depressions in its opposite ends concentric with the axis thereof, carburizing and hardening said roller, mounting it on centering spindles

Fig. 1.

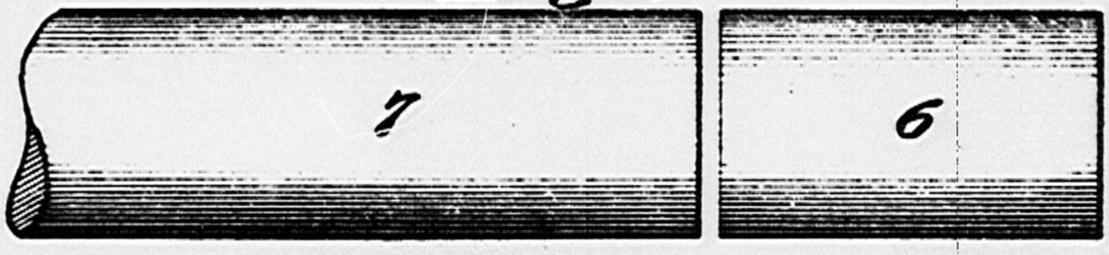


Fig. 2.

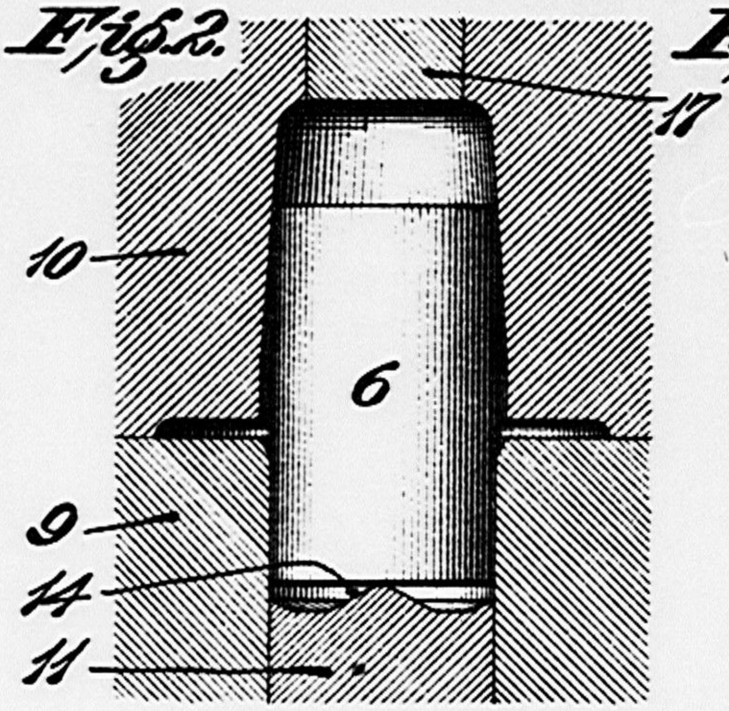


Fig. 3.

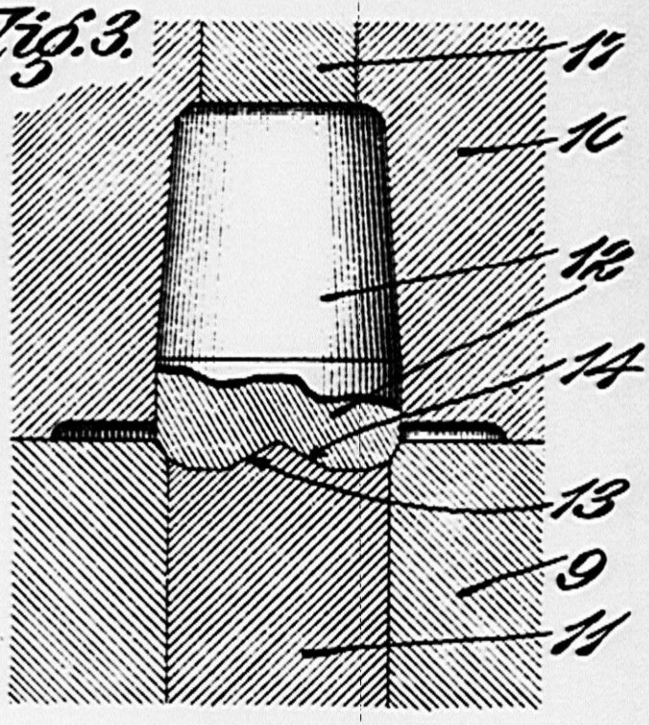


Fig. 4.

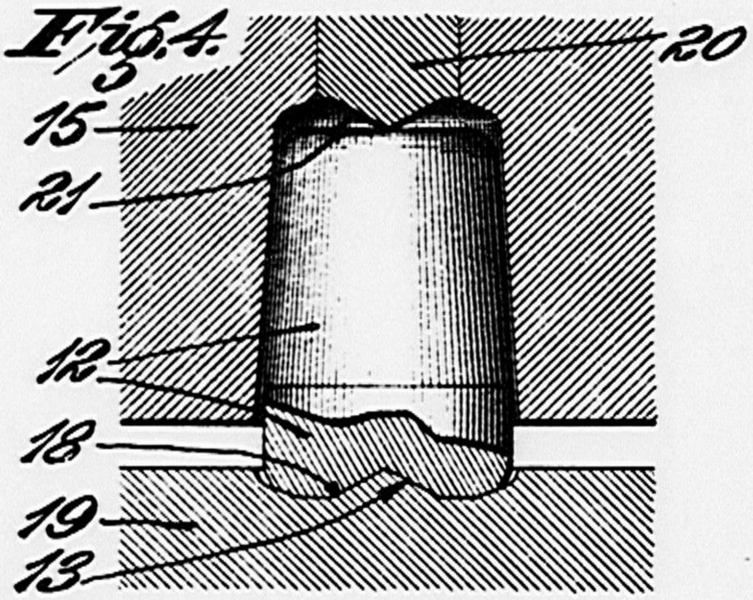


Fig. 5.

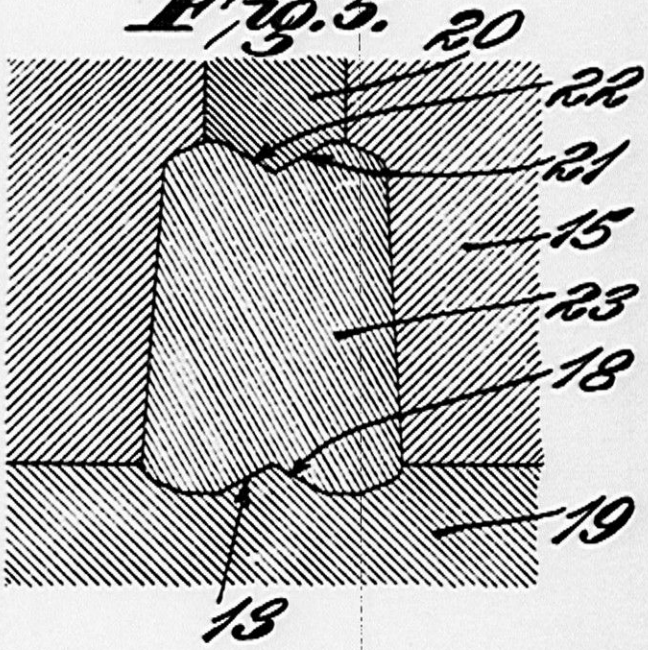
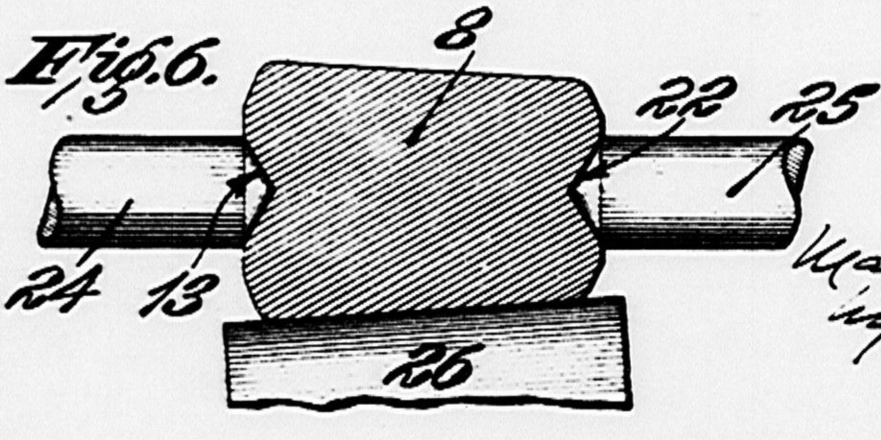


Fig. 6.



Inventor:
Marcus T. Lothrop,
his Attorneys.

No. 5300
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vs. Appellants,
Thomas E. Robertson etc.

entered into the end depressions thereof and grinding the surface thereof while thus centered.

5. The process of making conical rollers which consists
in upsetting in a conical die or dies a slug of substan-
23 tially the same volume as the finished roller to form
a green roller of approximately the size and shape
desired for the finished roller and with its ends adapted to
cooperate in centering said roller in a grinding machine,
carburizing and hardening said roller, centering it in a
grinding machine and grinding the surface thereof while
thus centered.

Signed at Canton, Ohio, this 22 day of July, 1921.

MARCUS T. LOTHROP.

24 *Oath.*

STATE OF OHIO,
County of Stark, ss:

Marcus T. Lothrop, the above named petitioner, being duly sworn, deposes and says that he is a citizen of the United States, and a resident of the city of Canton, in the county of Stark and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the new and useful improvement in Process of Making Conical Rollers described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or patented in any country foreign to the United States on an application filed more than twelve months before this application, or in public use or on sale in the United States for more than two years prior to this application; and that no application for patent on said improvement has been filed by him or his legal representatives or assigns in any country foreign to the United States.

MARCUS T. LOTHROP.

Subscribed and sworn to before me this 22 day of July, 1921. My commission expires March 19, 1923

[SEAL.] CAROLL MILLER,
Notary Public.

(Here follows photolithographed page 25.)

26 1921.

22-3
(Ex'r's Book) [232/170.]*

488260.

Div. [13]* 14.

Patent No. —.

Name: Marcus T. Lothrop. Assor. to The Timken Roller Bearing Company, of Canton, Ohio, a corp. of Ohio. of Canton.

County of ——.

State of Ohio.

Invention: Process of Making Conical Rollers.

	Original.	Renewed.
Petition,	July 28, 1921.	—— —, 192-.
Affidavit,	" " 1921.	—— —, 192-.
Specification,	" " 1921.	—— —, 192-.
Drawing,	" " 1921.	—— —, 192-.
Photo Copy,	Feb. 23, 1922.	—— —, 192-.
" "	3 sheets (appeal) 6/25-1927.	—— —, 192-.
First Fee Cash,	$15 July 28, 1921.	—— —, 192-.
" " Cert.,	—— —, 192-.	—— —, 192-.

Appln. filed complete July 28, 1921.

Examiner and Passed for Issue —— —, 192-. —— —, 192-.

	Exr. Div.	Exr. Div.
Notice of Allowance:	—— —, 192-.	—— —, 192-.
	By Commissioner.	By Commissioner
Final Fee Cash:	—— —, 192-.	—— —, 192-.
" " Cert.:	—— —, 192-.	—— —, 192-.
Patented:	—— —, ——.	—— —, 192-.

Attorney: Carr & Carr, Boatmen's Bank Bldg., St. Louis, Mo.

Associate Attorney: —— ——.

(No. of Claims Allowed: —.) Print Claims in O. G. (Cl.: —.)

Title as Allowed: ——.

[*Words and figures enclosed in brackets erased in copy.]

27 EXHIBIT B TO BILL OF COMPLAINT.

390.

Department of Commerce, United States Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the Petition, Specification, Oath and Drawing, as originally filed; and Filing Receipt, in the matter of the Pending Application of Marcus T. Lothrop. Filed January 20, 1922. Serial Number 530,643, for Improvement in Rollers for Roller Bearings.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twenty-fourth day of August in the year of our Lord, one thousand nine hundred and twenty-eight and of the Independence of the United States of America the one hundred and fifty-third.

[SEAL.] THOMAS E. ROBERTSON,
Commissioner of Patents.

Attest:
WILLIS B. MAGRUDER,
Chief of Division.

28 *Petition.*

Mail room, Jan. 20, 1922. U. S. Patent Office.

To the Commissioner of Patents.

Your petitioner, Marcus T. Lothrop, a citizen of the United States, and a resident of the city of Canton, in the county of Stark and state of Ohio, whose post-office address is care of The Timken Roller Bearing Company, Canton, Ohio, prays that letters patent may be granted to him for the improvement in Rollers for Roller Bearings, set forth in the annexed specification.

And he hereby appoints Carr & Carr (a firm composed of James A. Carr and T. Percy Carr, of Boatmen's Bank Building, St. Louis, Missouri,) his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

MARCUS T. LOTHROP.

Revenue stamp.

Canton, Ohio, January 16, 1922.

29 *Specification.*

To all whom it may concern:

Be it known that I, Marcus T. Lothrop, a citizen of the United States and a resident of the city of Canton, county of Stark and state of Ohio, have invented a new and useful improvement in Rollers for Roller Bearings of which the following is a specification.

My invention relates to rollers for roller bearings and has for its principal object to devise a roller that is economical to manufacture, that has an accurate and sound surface, that when hardened preserves in its finished state substantially the full depth of the hardened case, that is adapted for mounting in a grinding machine or the like for the purpose of changing its diameter or taper or correcting distortion, that is provided with suitable identification marks, and that will have other advantages. It consists in the roller hereinafter described and claimed.

In the accompanying drawing, wherein like numerals refer to like parts wherever they occur,

Fig. 1 is a side view of a roller embodying my invention;

Fig. 2 is an end view of such roller from the smaller end;

Fig. 3 is an axial section thereof;

Fig. 4 is a sectional view similar to Fig. 3 of a modified form of roller; and

Fig. 5 is an end view of the roller shown in Fig. 4 from the smaller end.

My roller 1 is preferably made from a cylindrical
30 slug of substantially the same mass as that required
for the finished roller. Preferably, such slug is a section cut off of a smooth or polished circular rod of steel that is capable of flowing plastically while cold. Ordinarily it is preferable to use a low-carbon steel and case-harden and harden it after the roller is formed; but high carbon steel may be used and may be treated cold or hot. Such plug is die-shaped into the form of a roller by upsetting the same throughout its length against the wall of a suitable die (or series of dies) of the size and form required. In the manufacture of taper rollers, the operation of upsetting usually has the effect of enlarging the diameter of the slug throughout the length thereof; but in some cases, the diameter of the slug may be enlarged at one end and re-

duced at the other end by being forced endwise in a die which tapers to a smaller diameter than the slug, or such slug may be reduced in diameter throughout its length. All of these operations are intended to be included within the meaning of the word "upsetting" as used herein.

Preferably the die is shaped so as to provide the roller with a rounded or radiused edge 2 at each end. Even if the bearing surface of the roller is ground or machined these radiused edges 2 tend to retain the characteristic appearance of upset metal and constitute ear marks by which rollers embodying the present invention may be recognized. At the larger end, the roller is usually provided with a conical portion 3 concentric with the main bearing surface and adapted to cooperate with the rib of a bearing cone. This portion 3 may be machined or
31 polished, if desired, but as above stated, the radiused or rounded edge 2 between it and the main bearing surface of the roller tends to retain its characteristic appearance of upset metal and is free from all machining marks made subsequent to upsetting.

During the upsetting operation (or operations), centering depressions 4 are formed in the ends of the roller. These depressions are primarily intended for cooperation with the centers of such a machine as a turning or shaving machine, a grinding machine, polishing machine, lapping machine or the like. For such purpose, the rim portion of the one of said depressions may be formed with a relatively narrow band 5 (as shown in Figs. 4 and 5), preferably with a frusto-conical surface corresponding with the inclination of the driving center or spindle with which it is designed to cooperate. In such case, the surface of such depression inside of said band preferably has a lower degree of inclination to the axis of the roller than said band. In consequence of this arrangement, the contact between the roller and the machine center is limited to the area of said band 5, so that when the roller is mounted on the spindle, it is frictionally driven thereby through the contact between the center and said band. This engagement is hereinafter referred to as a rim drive and may be obtained by making the conical end of the center more nearly perpendicular to the axis than the surface of the depression in the roller is; in which case said depression 4 may be of the simple conical shape illustrated in Figs. 1 to 3.

32 The depression 4 in the other end of the roller is also intended for cooperation with the idle center or tail stock of the machine. Preferably this second center is rotatably mounted and the second depression in the roller is similar to that above described, that is to say, it has an accurately centered frusto-conical band 5 of greater inclination to the axis of the roller than the portion inside thereof, so that the contact between the center and the roller will be limited to this rim band. While this rim drive has obvious advantages, the contact with the center may be in the axial portion of the recess. Likewise, while it is of great advantage to locate the centering depressions during the operation of upsetting, they may be drilled or bored therein, and such drilling or boring is advantageous when green rollers are made with screw machines operating on rods or bars. In such case, it is advantageous to drill the depression in one end prior to severance of the green roller from the rod or bar and drill the second depression prior to hardening.

Usually, rollers for roller bearings are hardened or case-hardened (a hardened case 6 being indicated in Fig. 4); and in practical manufacture, there is considerable loss and expense occasioned by the hardening process and the finishing operations. With my present roller, the danger of distortion during heat treatment is reduced to a minimum by reason of the fact that the centering bands are formed in the body of the roller. As these centering bands are very accurately positioned and formed during the upsetting operation and as they engage the machine centers
33 on wide circles, the heat treatment has very little, if any, effect in changing the concentricity of the centering bands with relation to the bearing surface of the roller, and such slight change is corrected accurately, economically and with a minimum of work. In other words, as the centering bands are in the body of the roller the effect of distortion is minimized, and as the bands cooperate with the machine centers directly, very little, if any, finishing work is required on the bearing surface; and as the centering bands are a permanent part of the roller, the roller can be at any time *be* recentered in the machine for the purpose of grinding it to a smaller diameter, different taper or the like.

In practice, it may be desirable to provide the driving center with small radially projecting knives or points which will mechanically engage the depressions in the ends of the rolls. These knives will form radial slits 7, preferably on the centering bands of the depressions and constitute identification marks for the rollers. Such marks may simply indicate the origin of the goods or may be grouped in various ways to indicate size, taper or other physical properties of the roller.

It is noted that by reason of the precision with which the centering bands may be made concentric with the bearing surface of the roller in the green state thereof and by reason of the effects of distortion being minimized at the location of said centering bands, the full depth of the hardened case is preserved in a large proportion of the finished articles, and even where it is necessary to grind away a portion of said hardened case, such grinding is less
34 than is customary in the process now usually practiced. Accordingly, the surface of the roller is left sound and free from the tool marks and minor flaws incident to the usual practice of grinding. So too, the upsetting of the metal under pressure improves its physical texture and better adapts it for the purpose of a roller bearing.

For fuller description of the process of manufacturing my roller, reference is made to my copending application Ser. No. 488,260, filed July 28, 1921.

35 What I claim is:

1. A roller for a roller bearing whose bearing surface is case-hardened, the hardened case being undiminished in thickness by any operation subsequent to hardening.

2. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, said roller being characterized by its main bearing surface being free from marks of finishing tools.

3. A conical roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, said roller being characterized by its main bearing surface being free from marks of finishing tools.

4. A case-hardened roller for a roller bearing whose entire case resulting from the hardening operation is preserved in the finished roller.

5. A roller having axial recesses in the ends thereof, one or both of said recesses having a rim portion whose inner surface is adapted for frictional cooperation with the driving center of a lathe or the like.

6. A roller having axial recesses in the ends thereof, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like.

7. A roller having axial recesses in the ends thereof, one of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric 36 with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like, and the other recess having a similar band adapted for cooperation with the idler center of such lathe.

8. A roller consisting of a slug upset endwise throughout its length inside a forming die and axially recessed in its ends.

9. A taper roller consisting of a slug upset endwise throughout its length inside a forming die and axially recessed in its ends.

10. A roller consisting of a slug with a smooth cylindrical surface upset endwise throughout its length inside a forming die.

11. A roller consisting of a high carbon steel slug upset endwise throughout its length inside a forming die.

12. A roller produced by forcing a cylindrical rod endwise in a conical die that tapers to a smaller diameter than said rod, where said rod is upset against the wall of said die.

13. A roller for a roller bearing, having axial depressions in its ends, the rim portion of one or both of said depressions comprising a narrow band concentric with the bearing surface of said roller and of steeper inclination to the axis of said roller than the surface of the portion of said recess inside of said band, whereby said band is adapted for cooperation with a lathe center or the like.

14. A roller having depressions in its ends, one or both of said depressions having the surface of its rim 37 portion in the form of a frusto-conical band adapted for frictional cooperation with the center of a lathe or the like to be driven frictionally thereby, and the sur-

face of said depression inside of said band having a lower inclination with reference to the axis of the roller than said band.

15. A roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth.

16. A taper roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth.

17. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having marks as and for the purposes set forth.

18. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having radially disposed marks as and for the purposes set forth.

19. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim
38 portions having equally spaced identification marks as and for the purpose set forth.

20. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portion or portions having identification marks as and for the purpose set forth.

21. A roller for a roller bearing made by the upsetting of a slug against the side of a die or circular section and characterized by having a radiused edge at the end, said edge having the appearance of cold-upset metal.

22. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and characterized by having a radiused edge at each end, said edges having the appearance of cold-upset metal.

23. A roller for a roller bearing made by the upsetting of a slug against the side of a die or circular section, one end of said roller having a conical portion adapted to cooperate with the rib of a bearing cone and said roller having a radiused edge between said conical portion of the

end and the bearing surface of the roller, said radiused edge preserving the appearance of upset metal.

Signed at Canton, Ohio, this 16th day of January, 1922.

MARCUS T. LOTHROP.

39 *Oath.*

STATE OF OHIO,
County of Stark, ss:

Marcus T. Lothrop, the above named petitioner, being duly sworn, deposes and says that he is a citizen of the United States, and a resident of the city of Canton and state of Ohio; that he verily believes himself to be the original, first and sole inventor of the new and useful improvement in Rollers for Roller Bearings described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or patented in any country foreign to the United States on an application filed more than twelve months before his application, or in public use or on sale in the United States for more than two years prior to this application; and that no application for patent on said improvement has been filed by him or his legal representatives or assigns in any country foreign to the United States.

MARCUS T. LOTHROP.

Subscribed and sworn to before me this 16th day of January, 1922. My commission expires March 19, 1923.

[SEAL.]

CASLER MILLER,
Notary Public.

(Here follows photolithographed page 40.)

Fig. 1.

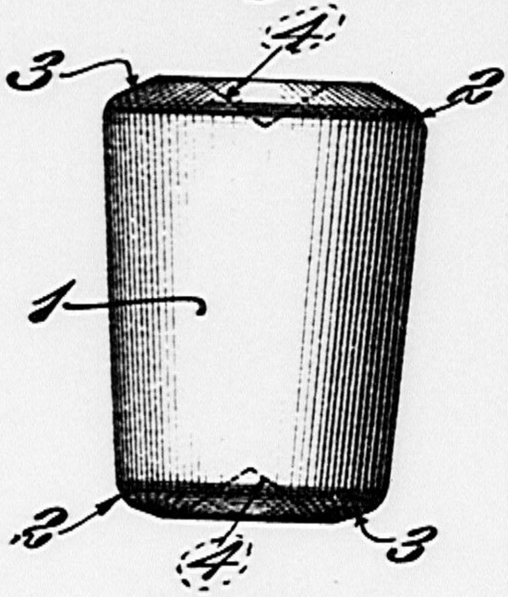


Fig. 4.

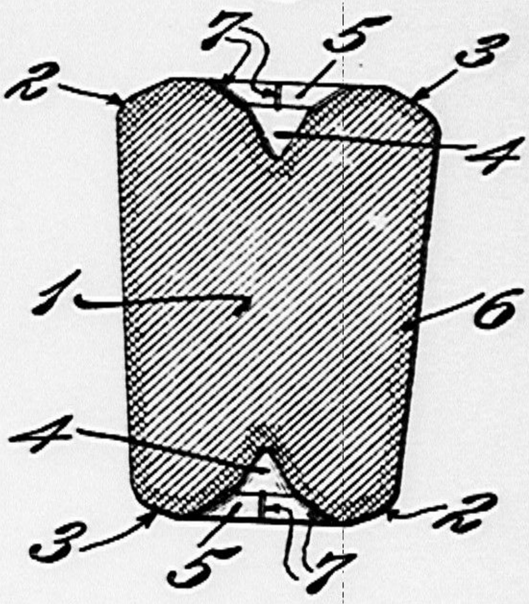


Fig. 2.

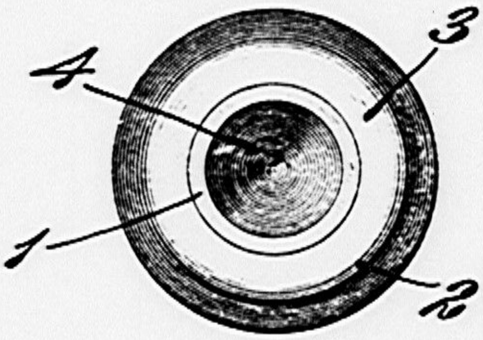


Fig. 5.

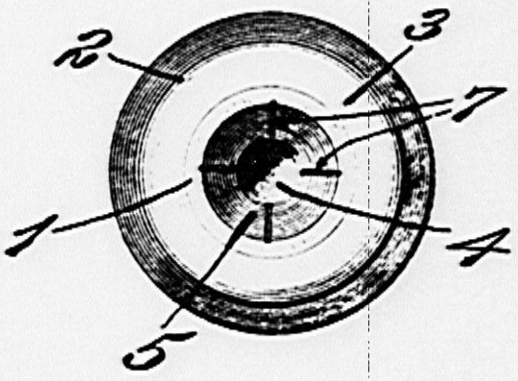
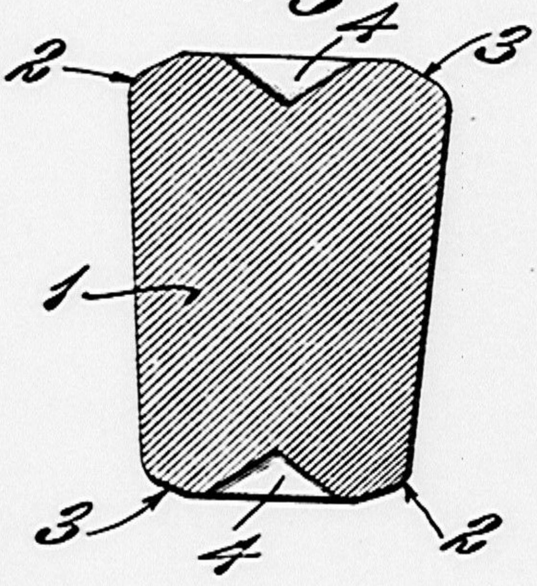


Fig. 3.



Inventor:

MARCUS T. LOTHROP

By CARR & CARR

his Attorneys.

No. 5300
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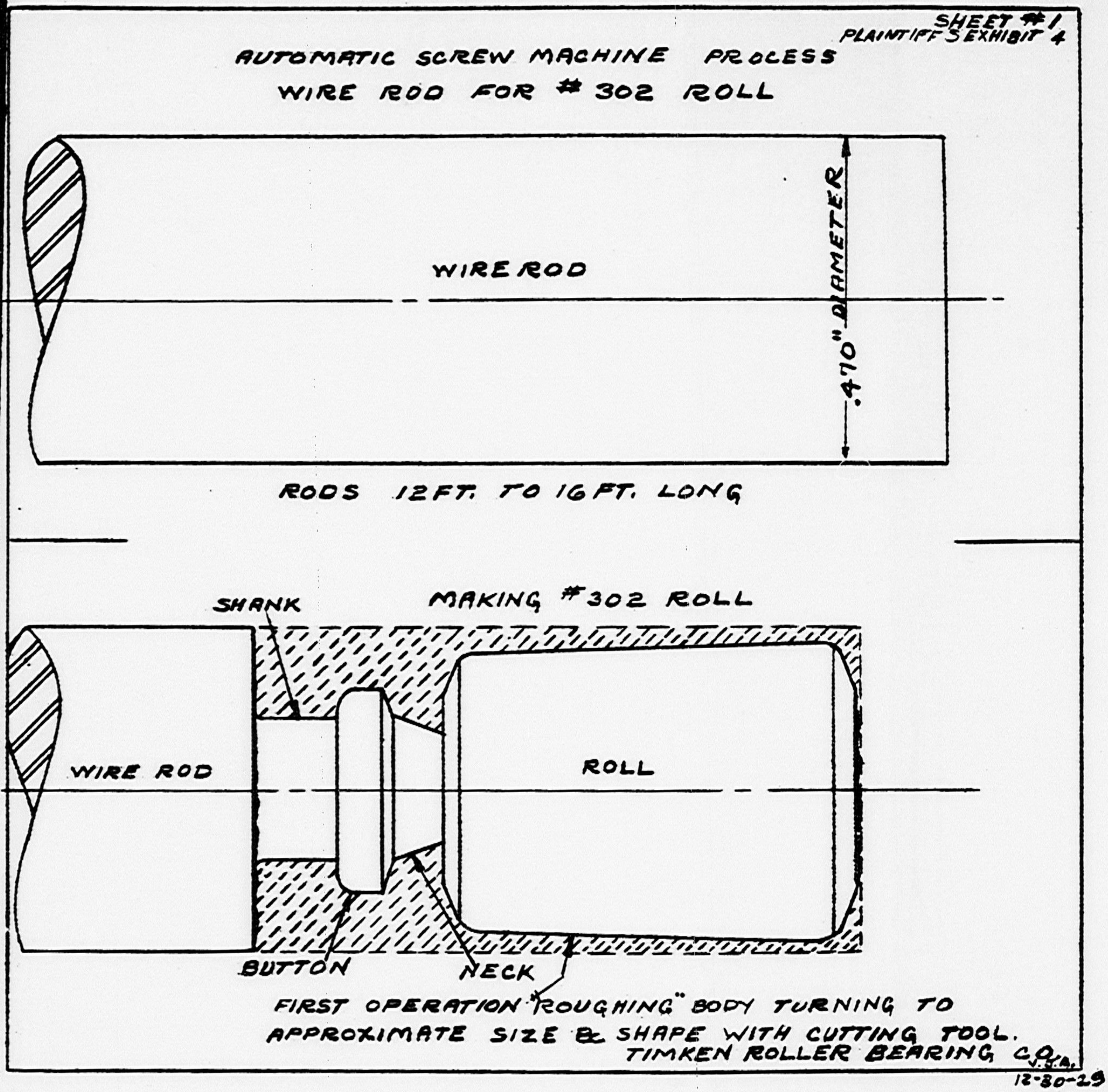
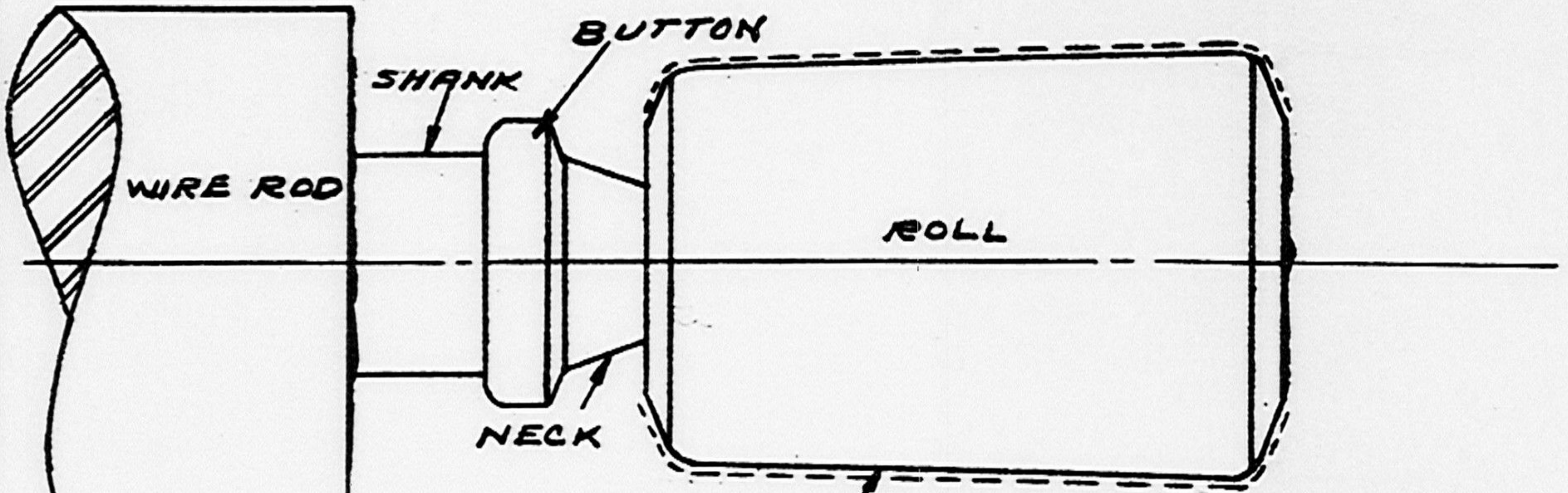
Thomas E. Robertson etc.


SHEET #1
PLAINTIFF'S EXHIBIT 4
AUTOMATIC SCREW MACHINE PROCESS
WIRE ROD FOR #302 ROLL
WIRE ROD
.470" DIAMETER
RODS 12 FT. TO 16 FT. LONG
MAKING #302 ROLL
SHANK
WIRE ROD
ROLL
BUTTON
NECK
FIRST OPERATION "ROUGHING" BODY TURNING TO
APPROXIMATE SIZE & SHAPE WITH CUTTING TOOL.
TIMKEN ROLLER BEARING CO.
J.S.A.
12-30-29

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

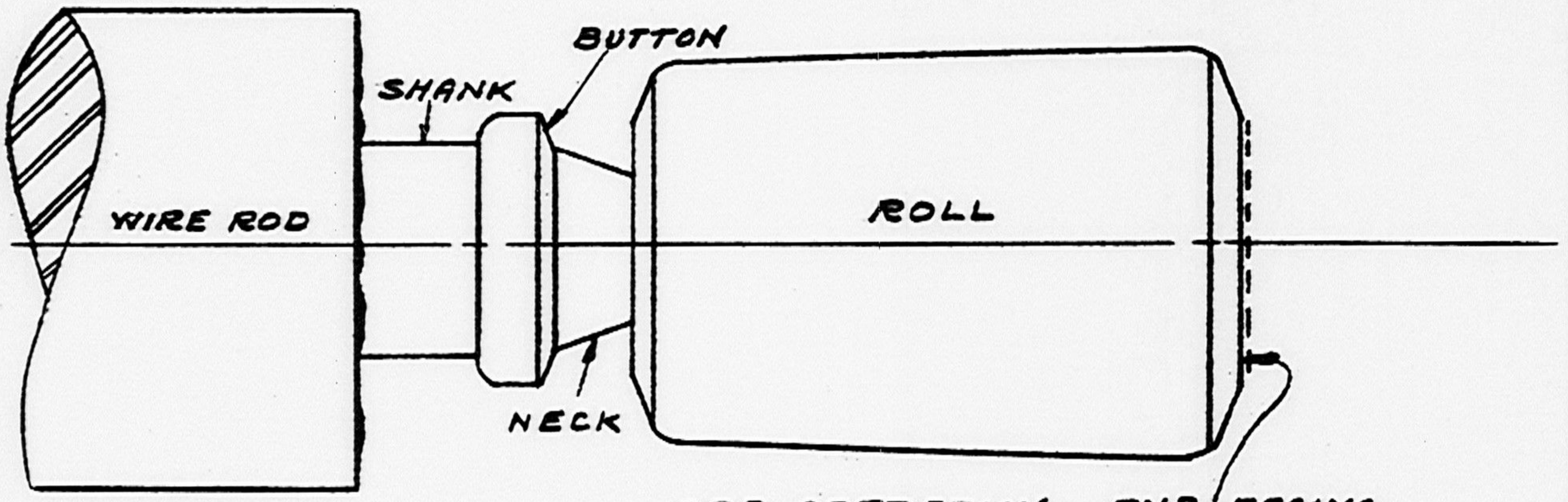
SHEET #2
PLAINTIFF'S EXHIBIT 4

AUTOMATIC SCREW MACHINE PROCESS
MAKING #302 ROLL



2ND. OPERATION "FINISHING" BODY i.e. TURNING TO EXACT DIMENSIONS WITH CUTTING TOOL.

MAKING #302 ROLL



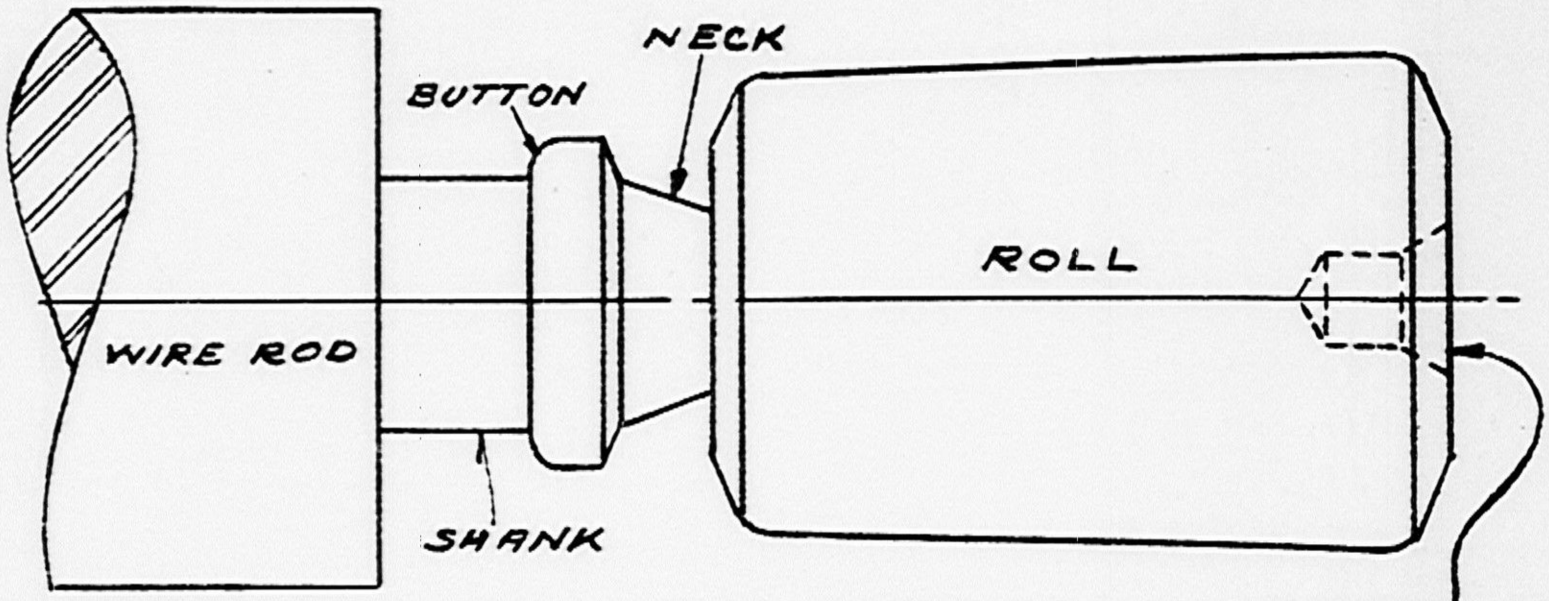
3RD OPERATION END FACING

TIMKEN ROLLER BEARING CO.
V.J.A.
12-30-29

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

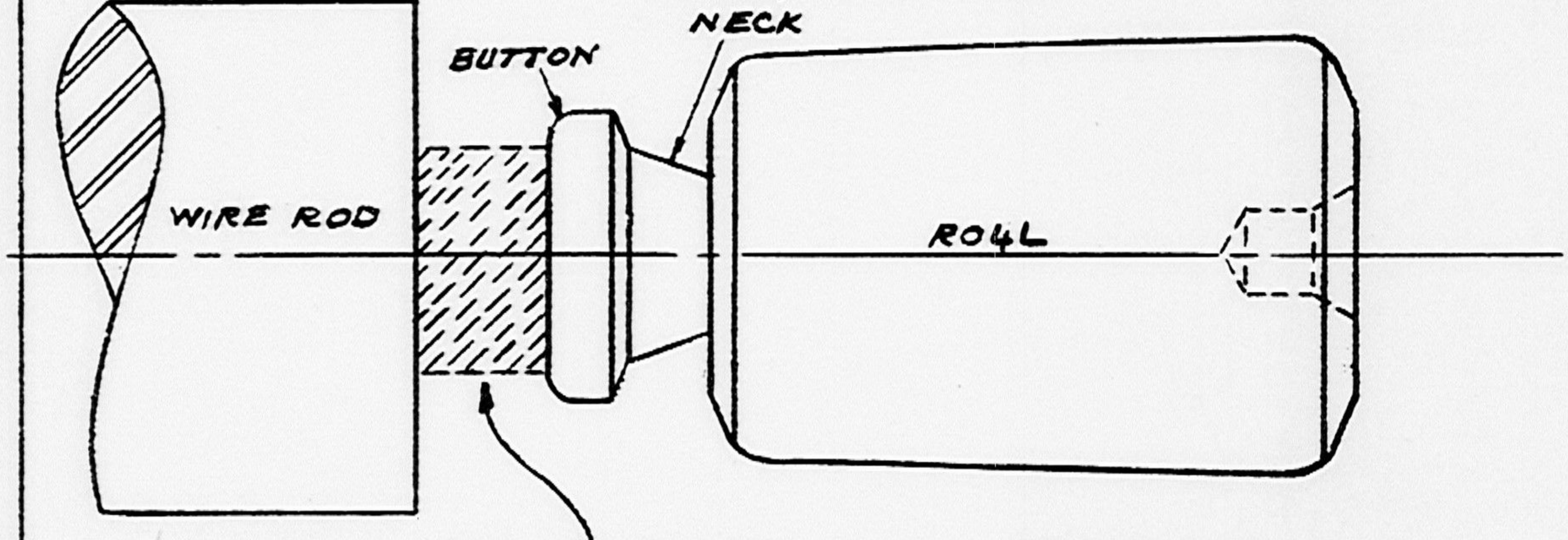
SHEET #3

AUTOMATIC SCREW MACHINE PROCESS PLAINTIFF'S EXHIBIT 4
MAKING #302 ROLL.



4TH. OPERATION CENTER DRILLING.

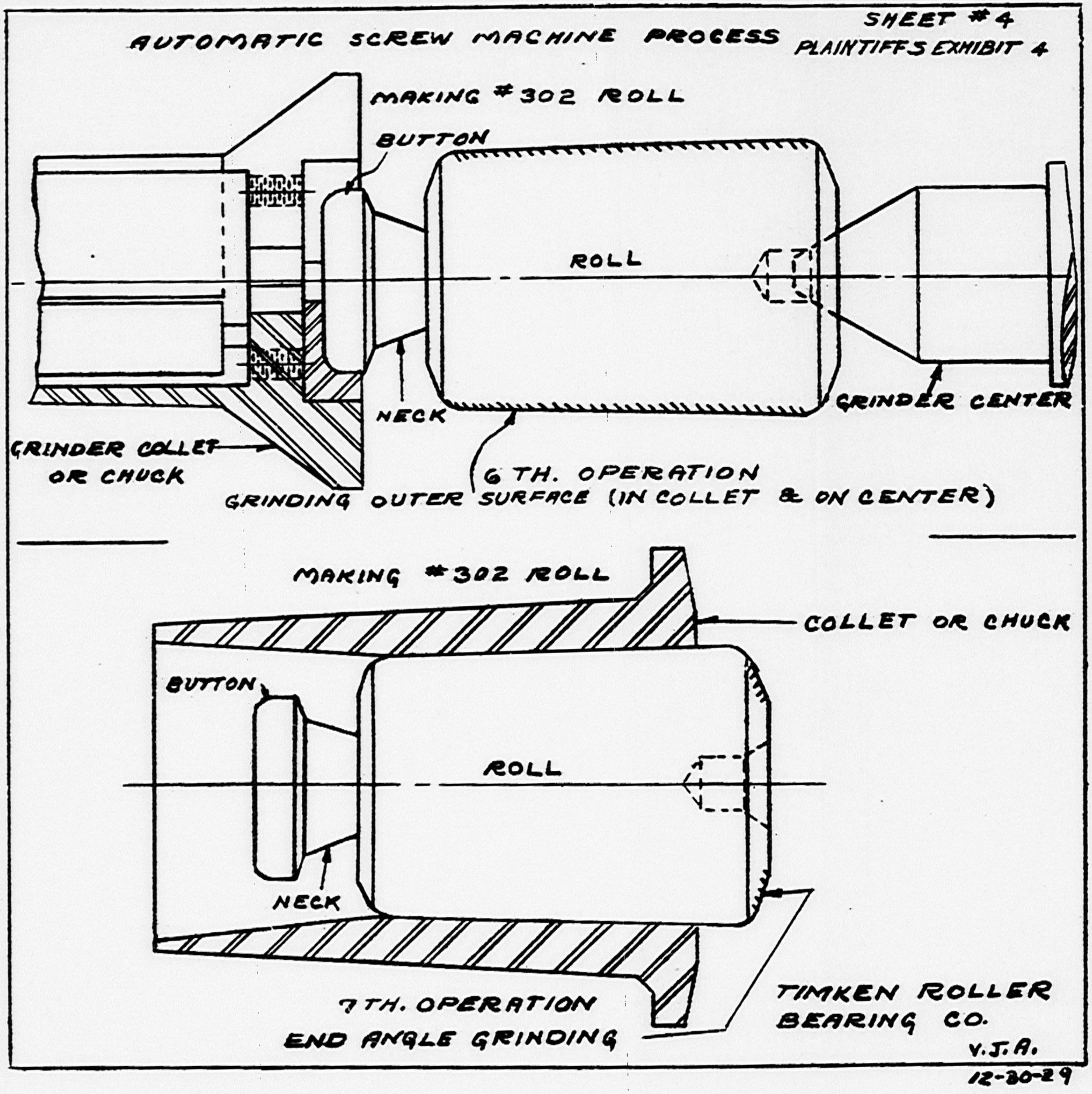
MAKING #302 ROLL



SHANK CUT OFF 5TH. OPERATION

TIMKEN ROLLER BEARING CO.

V.J.A.
12-30-29



No. 5300
Marcus T. Lothrop et al.,
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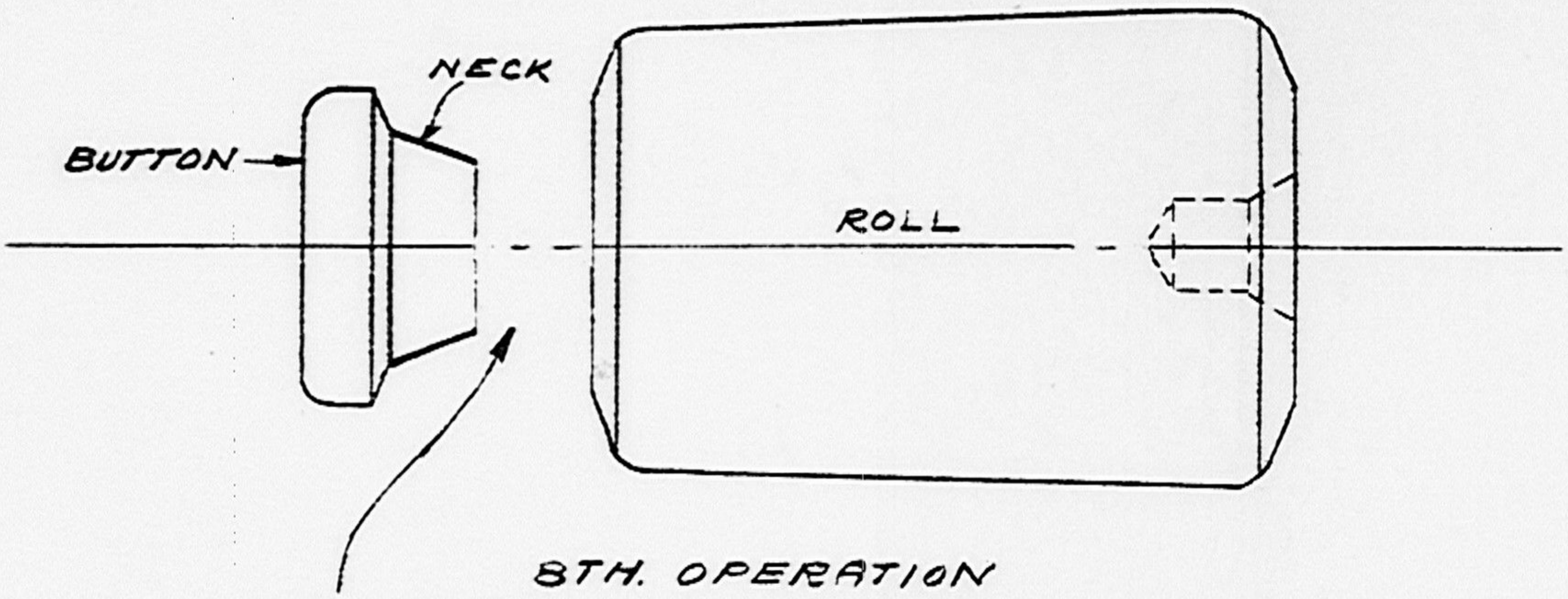
Thomas E. Robertson etc.

SHEET #5

PLAINT.FF'S EXHIBIT 4

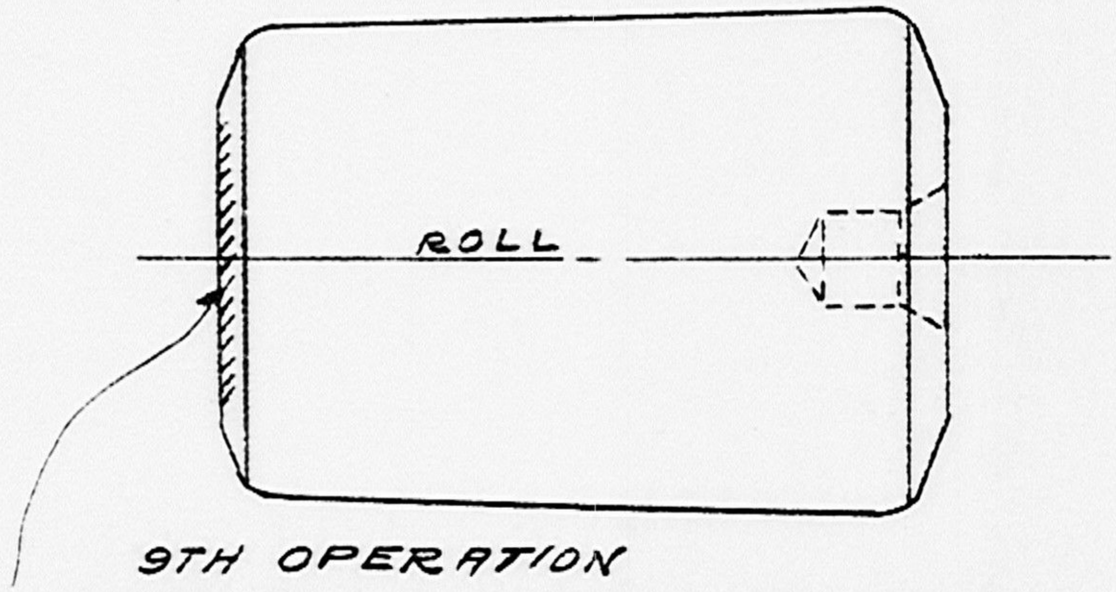
AUTOMATIC SCREW MACHINE PROCESS

MAKING #302 ROLL



8TH. OPERATION
BREAKING OFF BUTTON AND NECK

MAKING # 302 ROLL



9TH OPERATION
GRINDING OFF ROUGH EDGES LEFT FROM
BREAKING OFF BUTTON AND NECK

TIMKEN ROLLER BEARING CO.

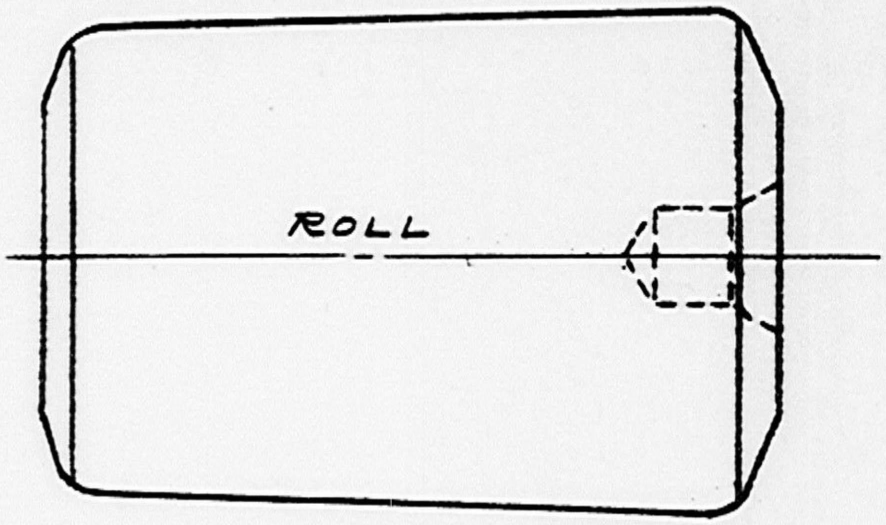
V.J.A.
12-30-29

SHEET #6

PLAINTIFFS EXHIBIT 4

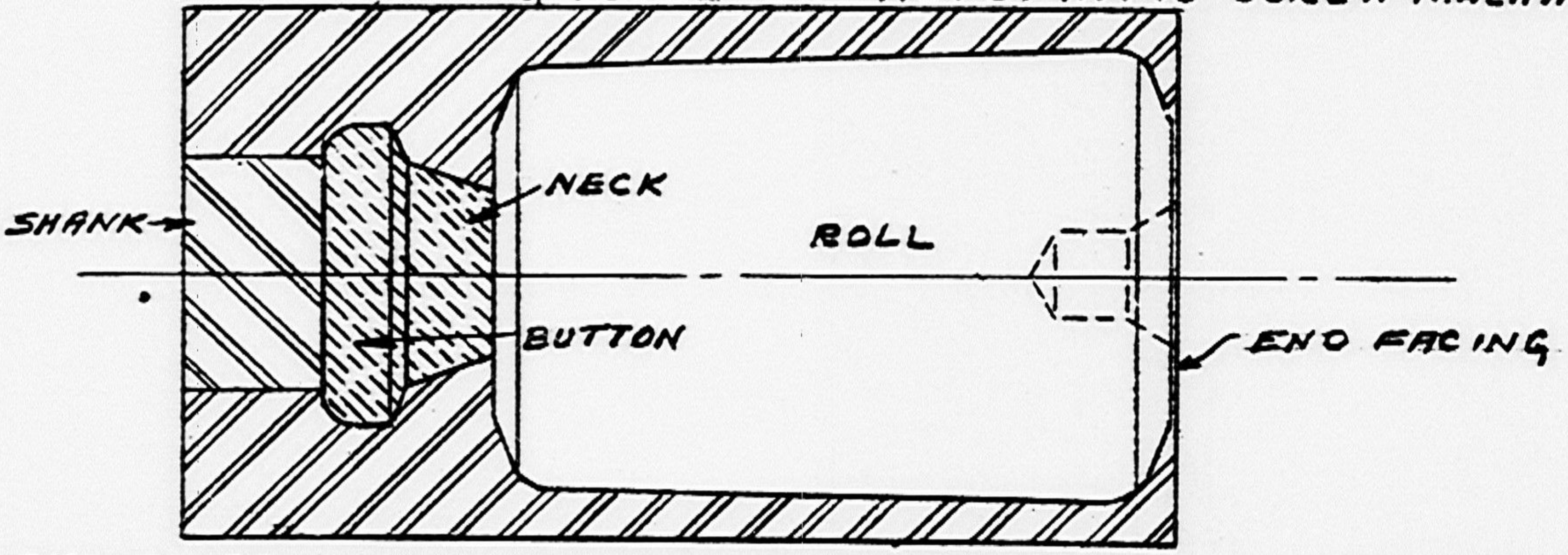
AUTOMATIC SCREW MACHINE PROCESS

#302 ROLL



FINISHED ROLL

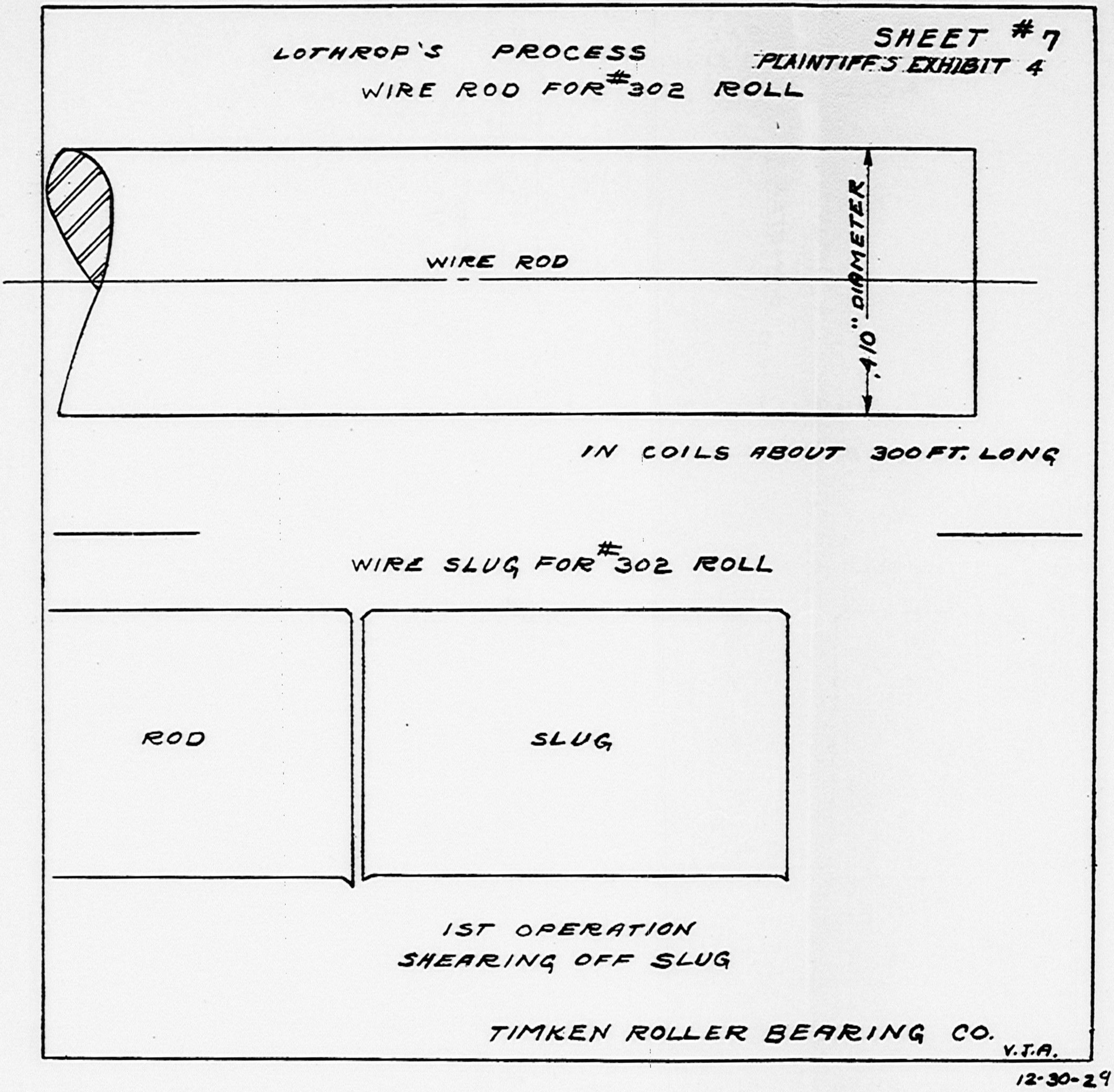
#302 ROLL SHOWING STOCK REQUIRED
FOR MAKING ROLL ON AUTOMATIC SCREW MACHINE



SHADED AREA SHOWS PORTIONS REMOVED IN VARIOUS OPERATIONS
STOCK IS LARGER IN DIAMETER THAN
FINISHED AUTOMATIC ROLL

TIMKEN ROLLER BEARING CO.
V.J.A.
12-30-29

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

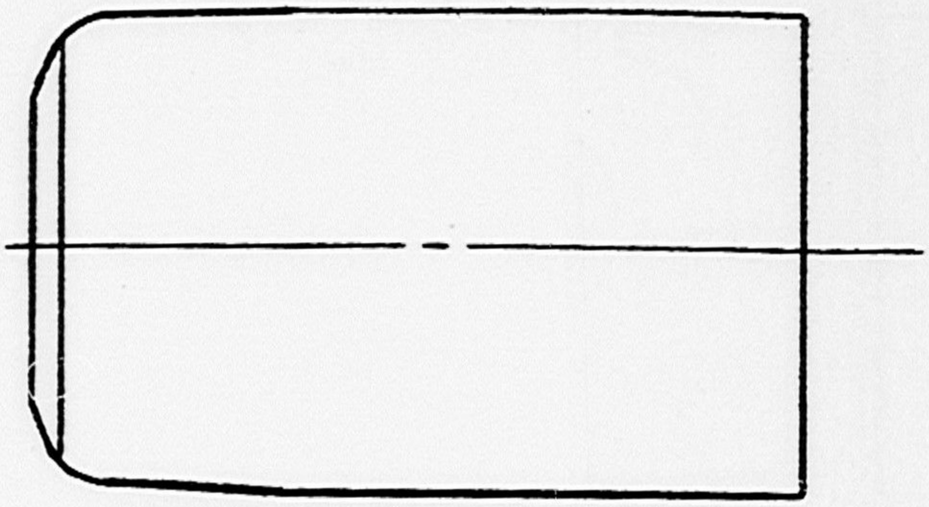


No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

SHEET #8
PLAINTIFF'S EXHIBIT 4

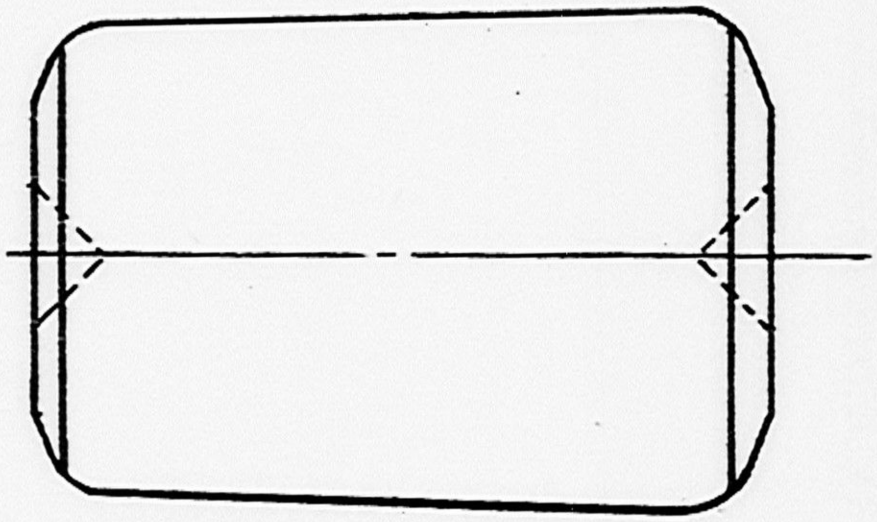
LOTHROPS PROCESS

MAKING #302 ROLL



2ND OPERATION
PRELIMINARY DIE FORMING

MAKING #302 ROLL

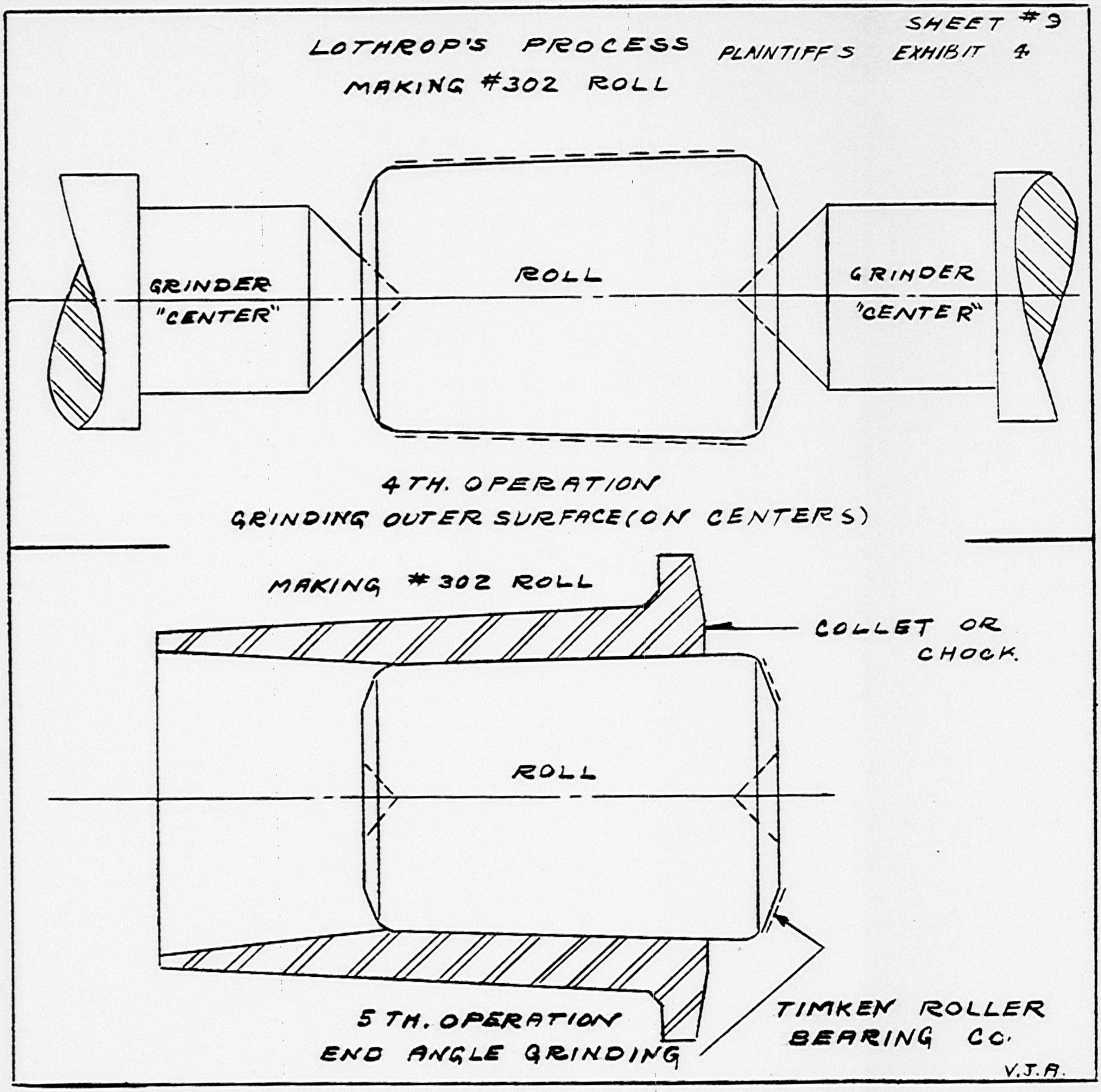


3RD OPERATION
FINAL DIE FORMING.

TIMKEN ROLLER BEARING CO
V.J.A.

12-30-29

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

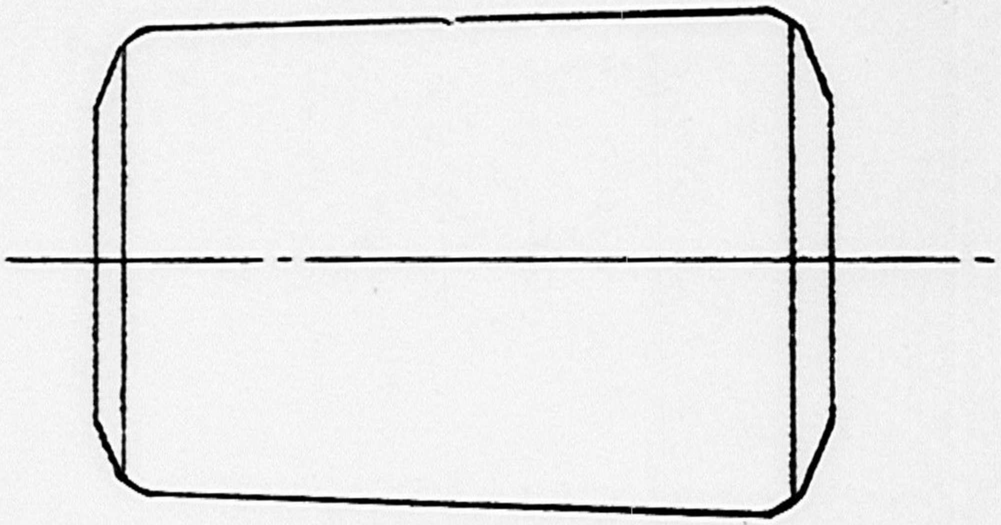

SHEET #9
LOTHROP'S PROCESS
PLAINTIFF'S EXHIBIT 4
MAKING #302 ROLL
GRINDER "CENTER"
ROLL
GRINDER "CENTER"
4TH. OPERATION
GRINDING OUTER SURFACE (ON CENTERS)
MAKING #302 ROLL
COLLET OR CHOCK.
ROLL
5 TH. OPERATION
END ANGLE GRINDING
TIMKEN ROLLER BEARING CO.
V.J.A.

12-30-29

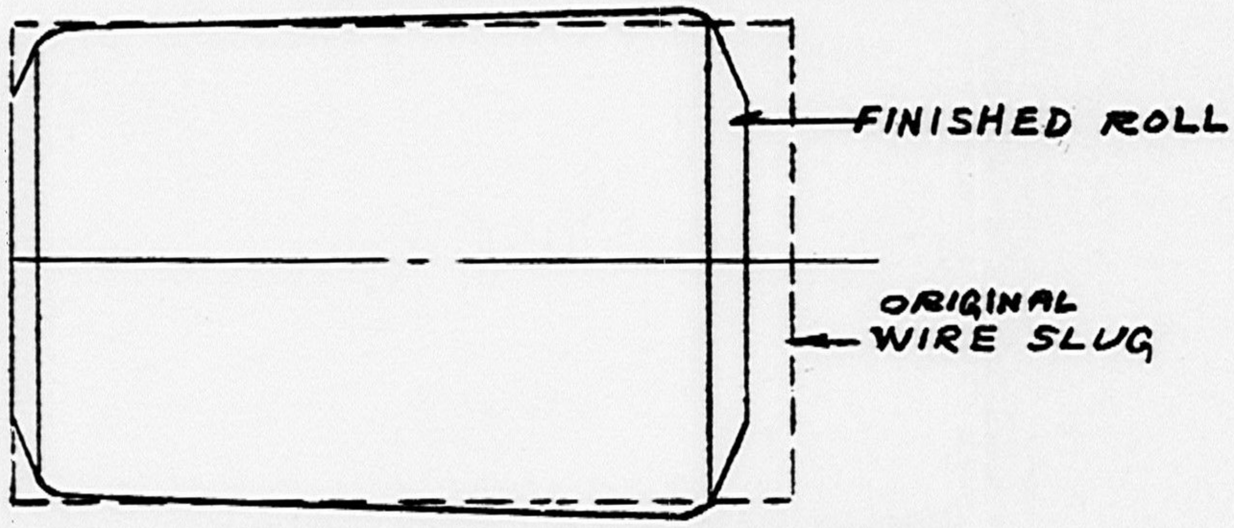
SHEET #10
PLAINTIFF'S EXHIBIT 4

LOTHROP'S PROCESS

#302 FINISHED ROLL



#302 ROLL SHOWING SLUG REQ'D FOR MAKING ROLL BY LOTHROP PROCESS



LOTHROP SLUG IS SMALLER IN DIAMETER THAN FINISHED LOTHROP ROLL

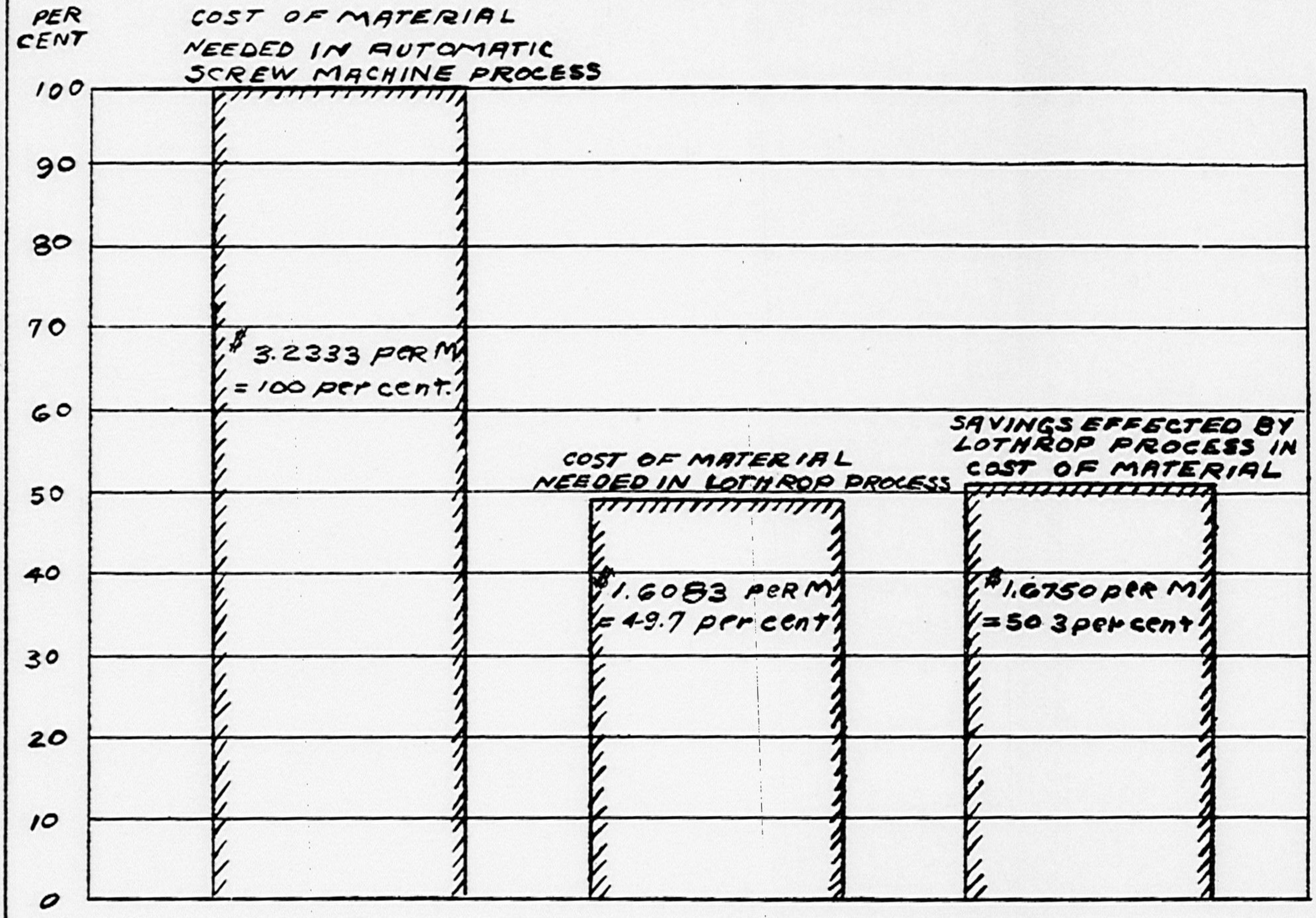
TIMKEN ROLLER BEARING CO. V.J.A.

12-30-29.

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

SHEET #11
PLAINTIFF'S EXHIBIT 4

COMPARISON OF MATERIAL COST FOR #302 GREEN ROLL

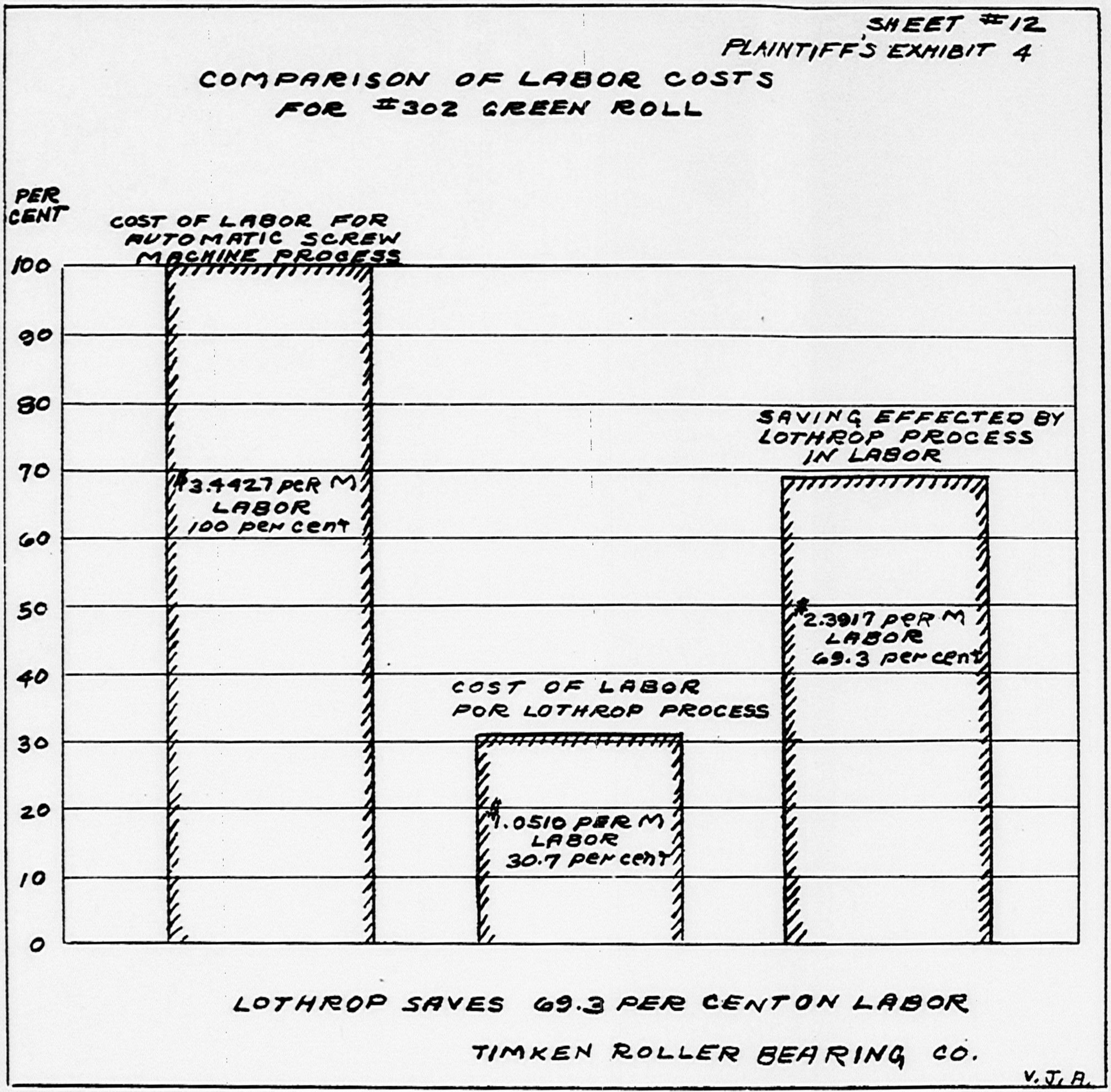


LOTHROP SAVES 50.3 PER CENT OF MATERIAL COST

TIMKEN ROLLER BEARING CO.

V.J.A.
12-30-29

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson, etc.



SHEET #12
PLAINTIFF'S EXHIBIT 4

COMPARISON OF LABOR COSTS FOR #302 GREEN ROLL

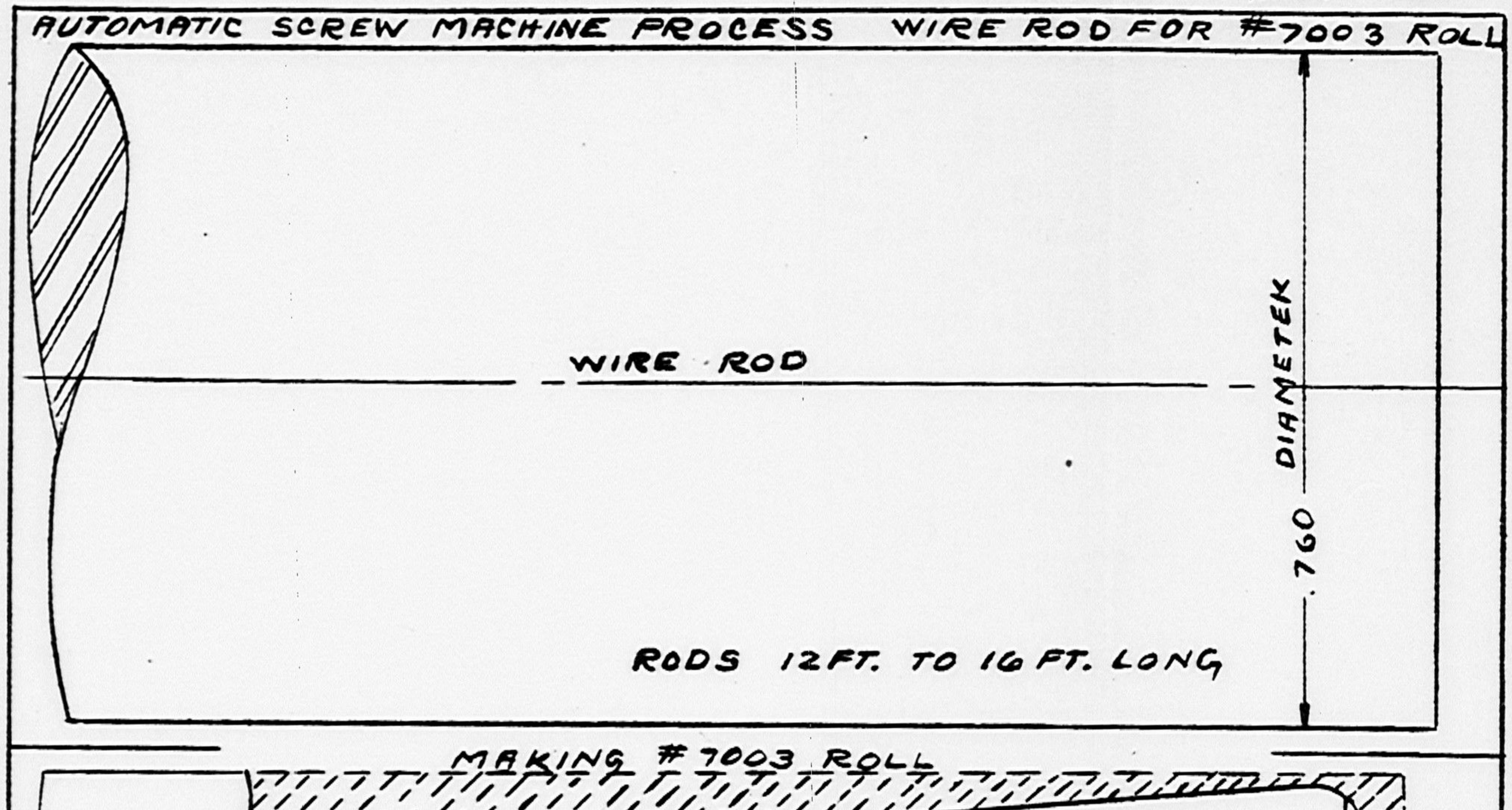
LOTHROP SAVES 69.3 PER CENT ON LABOR

TIMKEN ROLLER BEARING CO.

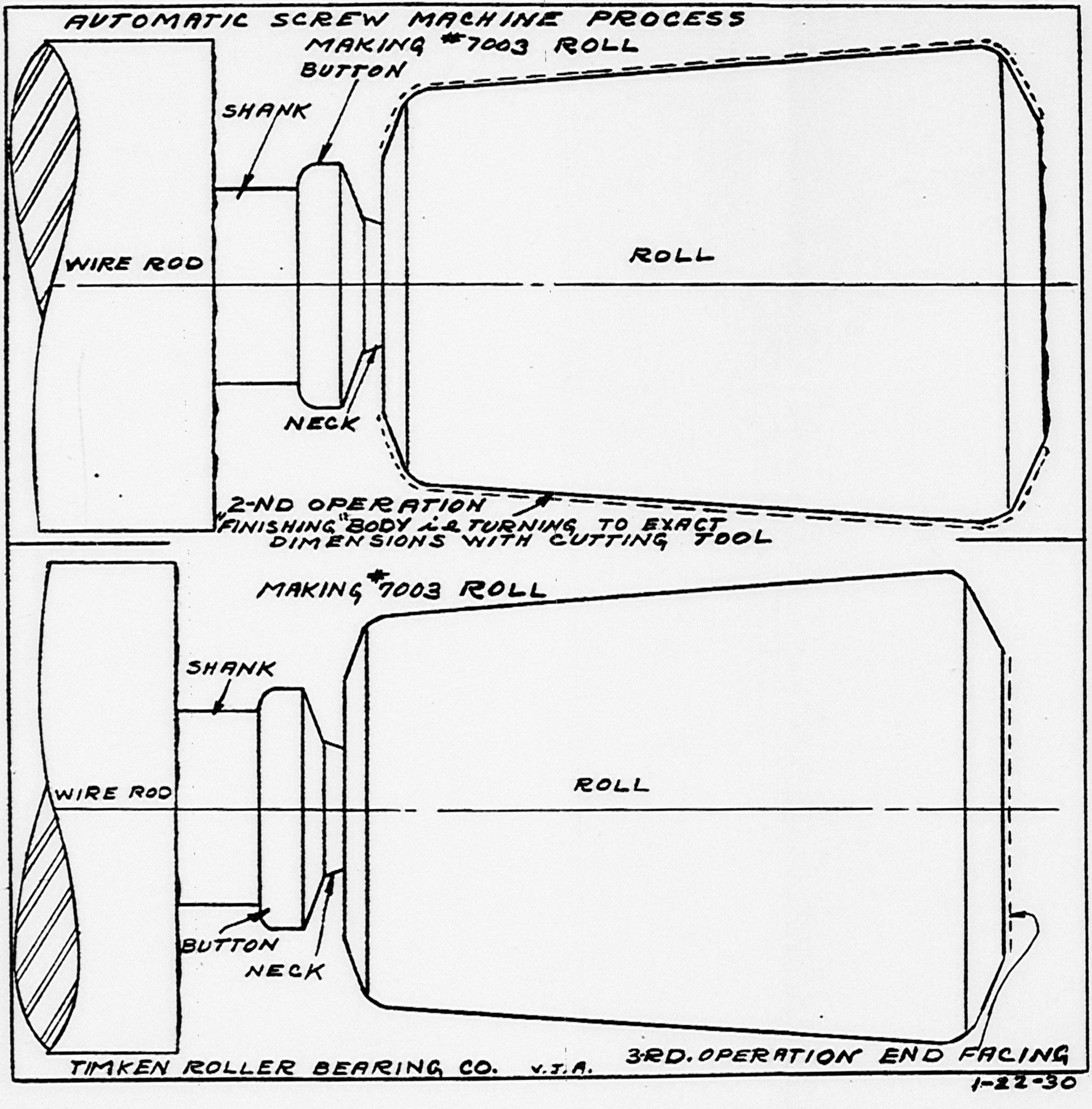
V. J. A.

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson, etc.

PLAINTIFF'S EXHIBIT 4
SHEET #20

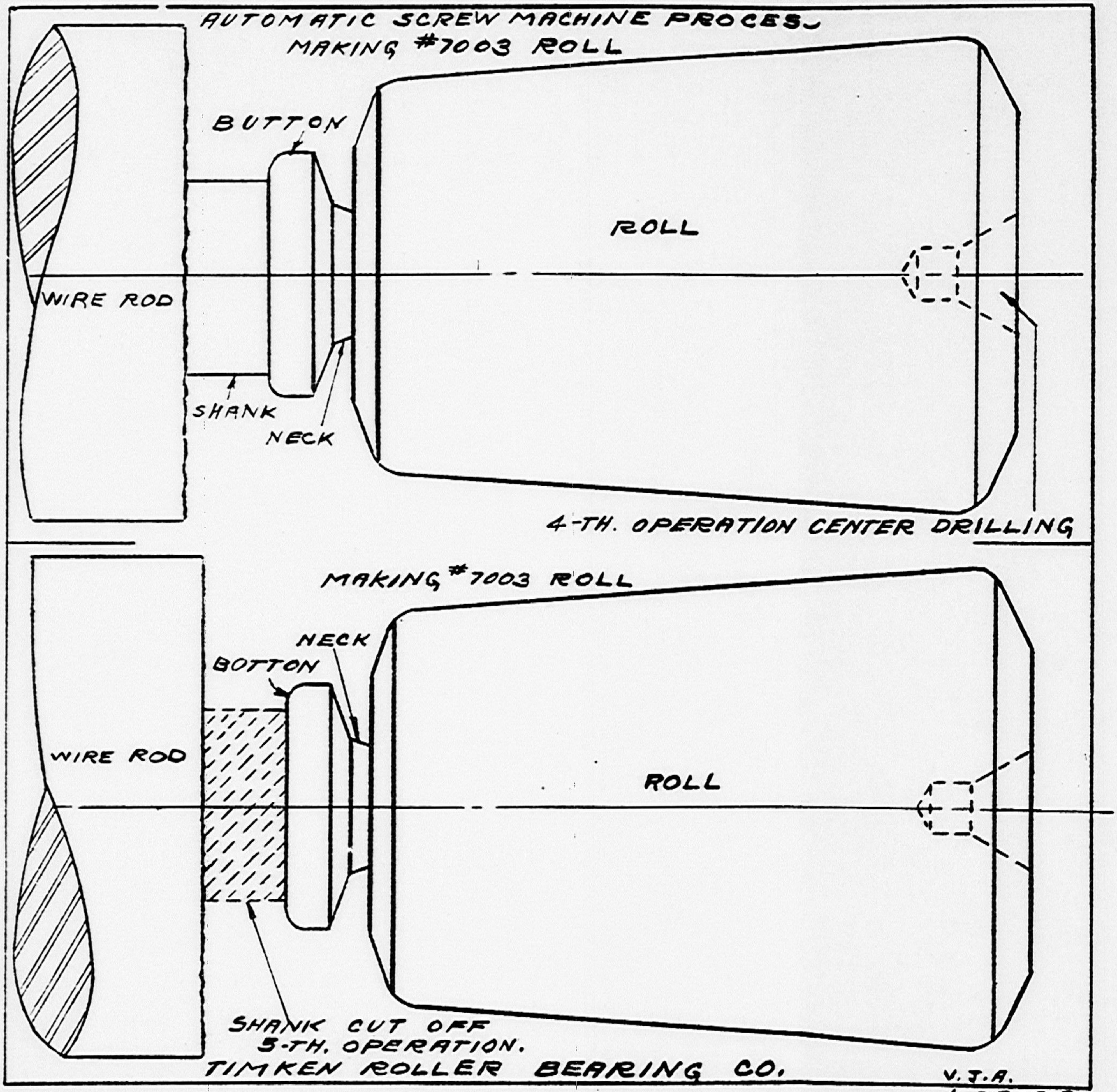

AUTOMATIC SCREW MACHINE PROCESS WIRE ROD FOR #7003 ROLL
WIRE ROD
DIAMETER
.760
RODS 12 FT. TO 16 FT. LONG
MAKING #7003 ROLL
NECK
ROLL
WIRE ROD
SHANK
BUTTON
FIRST OPERATION "ROUGHING" BODY TURNING TO APPROXIMATE SIZE AND SHAPE WITH CUTTING TOOL
TIMKEN ROLLER BEARING CO.
V.T.A.
-22-30

PLAINTIFF'S EXHIBIT 4
SHEET #21


AUTOMATIC SCREW MACHINE PROCESS
MAKING #7003 ROLL
BUTTON
SHANK
WIRE ROD
ROLL
NECK
2-ND OPERATION
"FINISHING" BODY i.e. TURNING TO EXACT DIMENSIONS WITH CUTTING TOOL
MAKING #7003 ROLL
SHANK
WIRE ROD
ROLL
BUTTON
NECK
TIMKEN ROLLER BEARING CO. V.J.A.
3RD. OPERATION END FACING
1-22-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
ThomasE. Robertson etc.

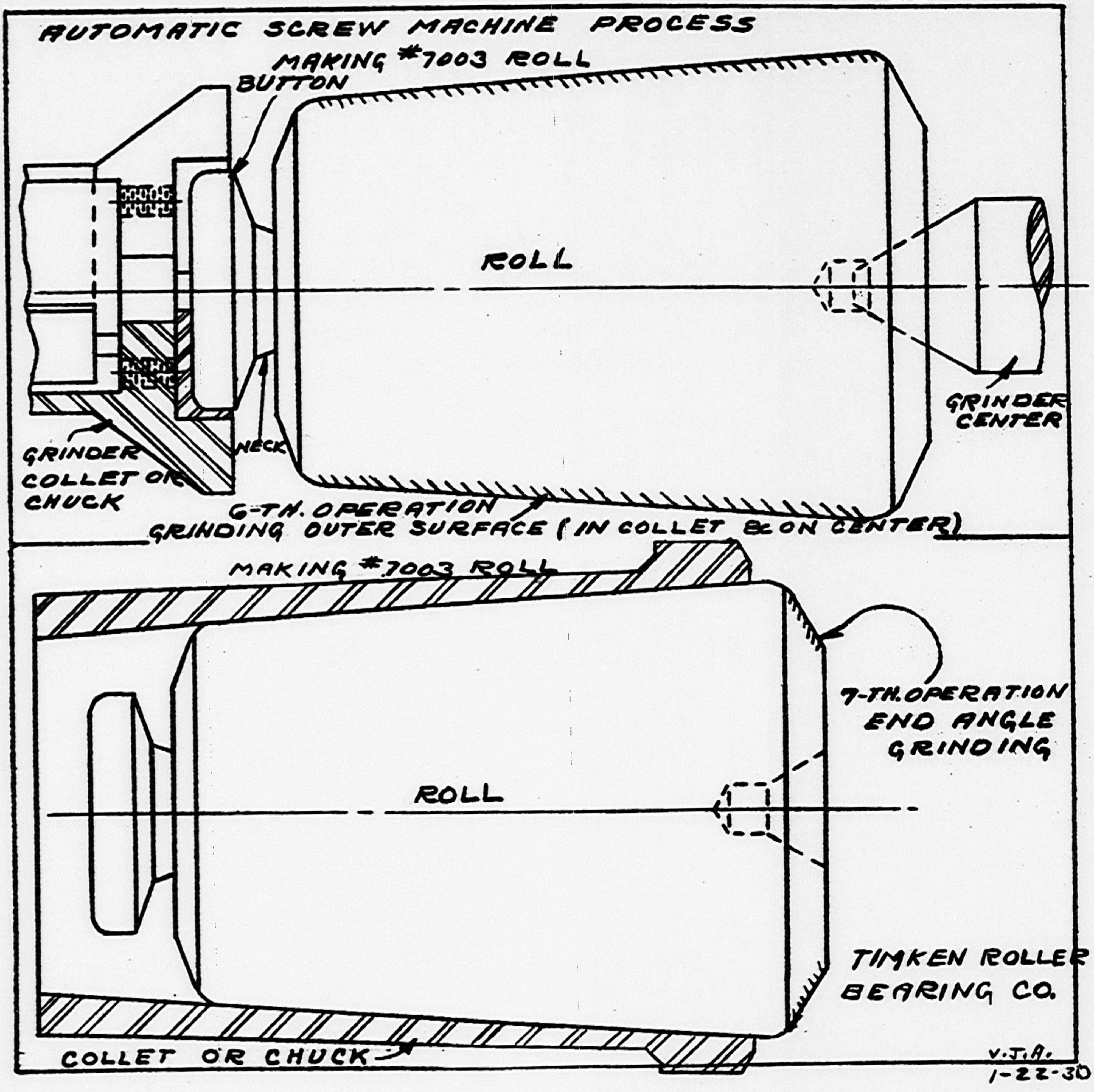
PLAINTIFFS EXHIBIT 4
SHEET #22



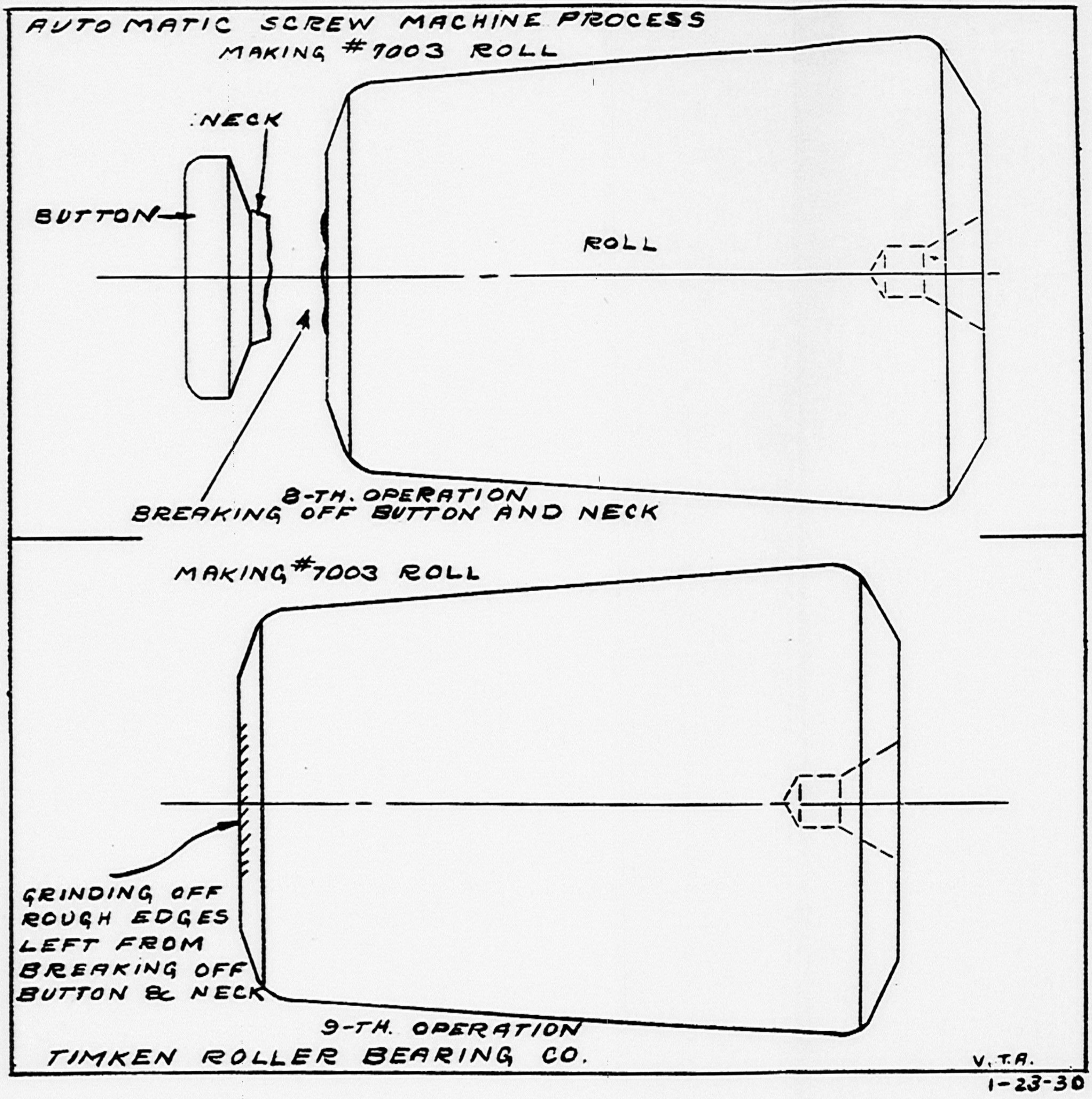
V.J.A.
1-22-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

PLAINTIFF'S EXHIBIT 4
SHEET #23

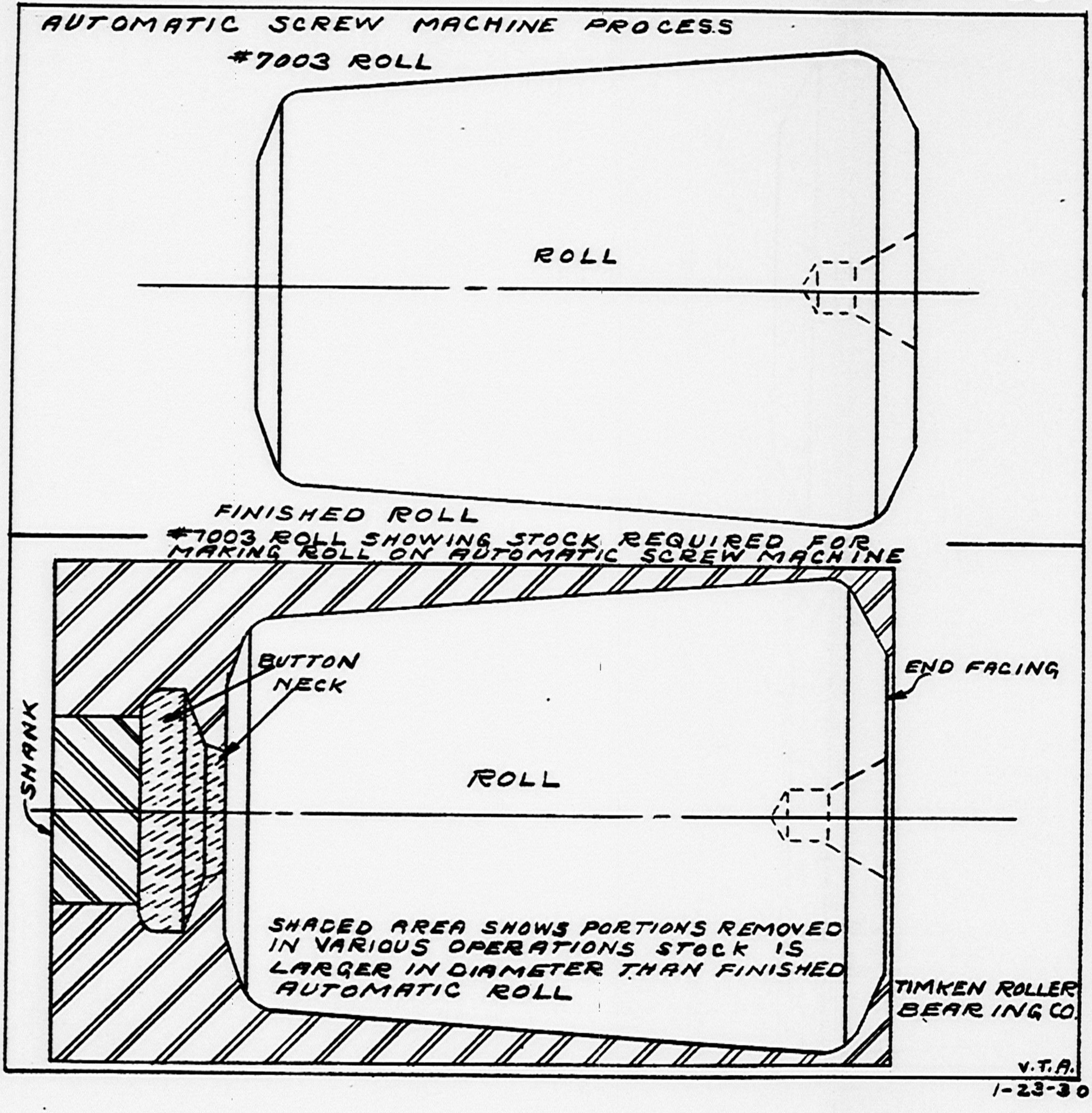


PLAINTIFF'S EXHIBIT 4
SHEET # 24


AUTOMATIC SCREW MACHINE PROCESS
MAKING #7003 ROLL
NECK
BUTTON
ROLL
8-TH. OPERATION
BREAKING OFF BUTTON AND NECK
MAKING #7003 ROLL
GRINDING OFF ROUGH EDGES LEFT FROM BREAKING OFF BUTTON & NECK
9-TH. OPERATION
TIMKEN ROLLER BEARING CO.
V.T.A.
1-23-30

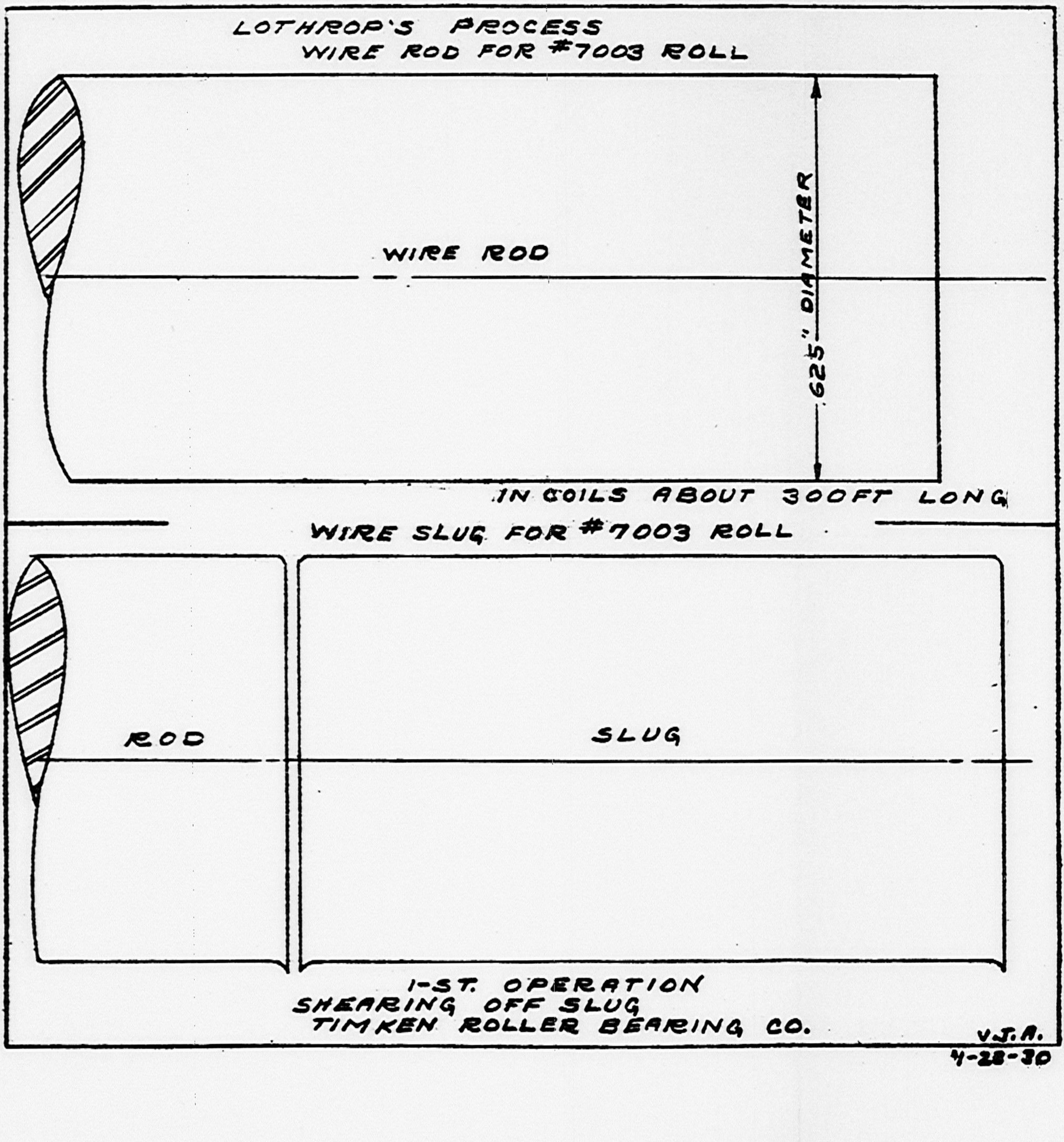
No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

PLAINTIFF'S EXHIBIT 4
SHEET # 25


AUTOMATIC SCREW MACHINE PROCESS
#7003 ROLL
ROLL
FINISHED ROLL
#7003 ROLL SHOWING STOCK REQUIRED FOR MAKING ROLL ON AUTOMATIC SCREW MACHINE
BUTTON
NECK
END FACING
SHANK
ROLL
SHADED AREA SHOWS PORTIONS REMOVED IN VARIOUS OPERATIONS STOCK IS LARGER IN DIAMETER THAN FINISHED AUTOMATIC ROLL
TIMKEN ROLLER BEARING CO.
V.T.A.
1-23-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

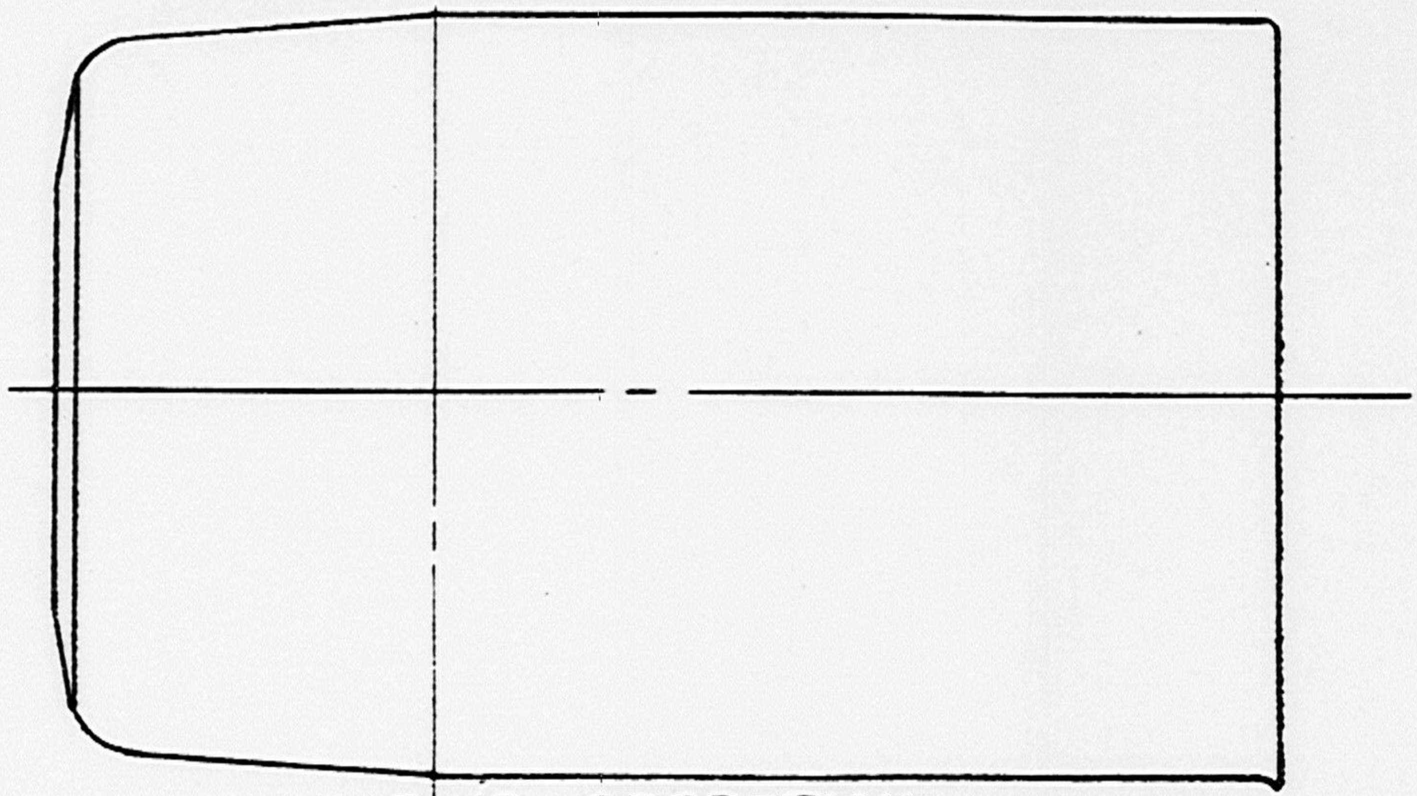
PLAINTIFF'S EXHIBIT 4
SHEET #26



No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

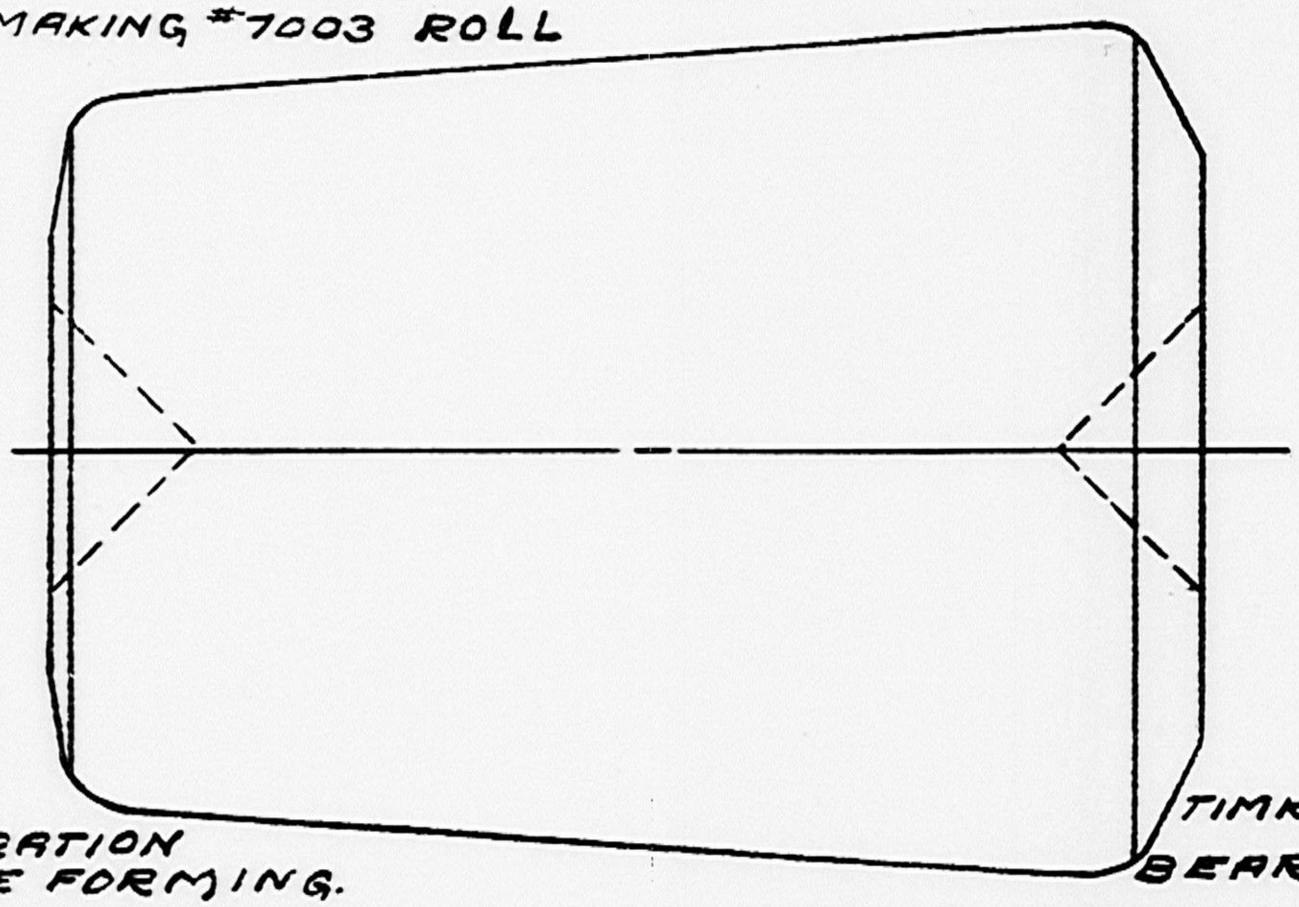
PLAINTIFFS EXHIBIT 4
SHEET #27

LOTHROPS PROCESS
MAKING #7003 ROLL



2-ND OPERATION
PRELIMINARY DIE FORMING

MAKING #7003 ROLL

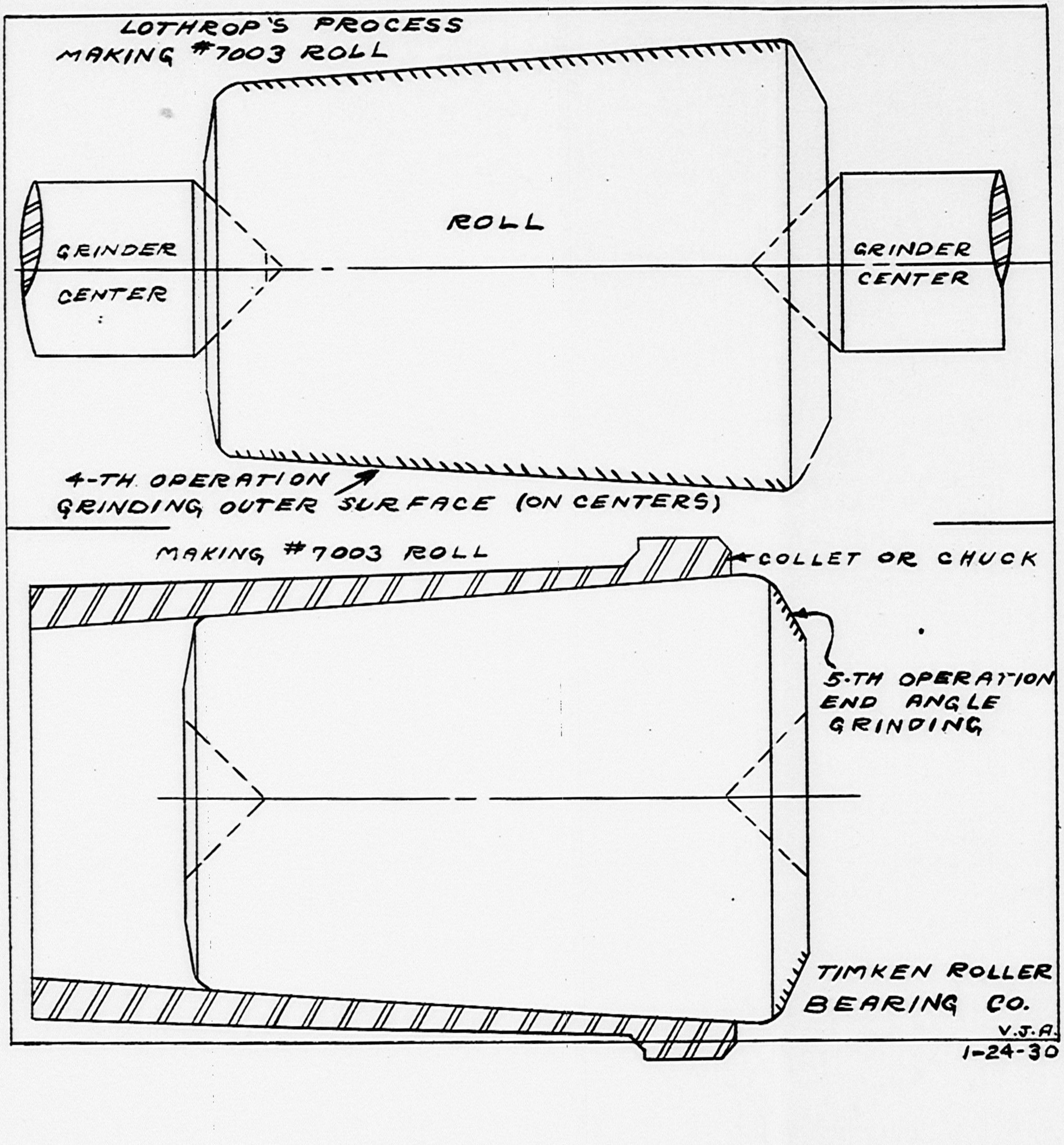


3RD OPERATION
FINAL DIE FORMING.

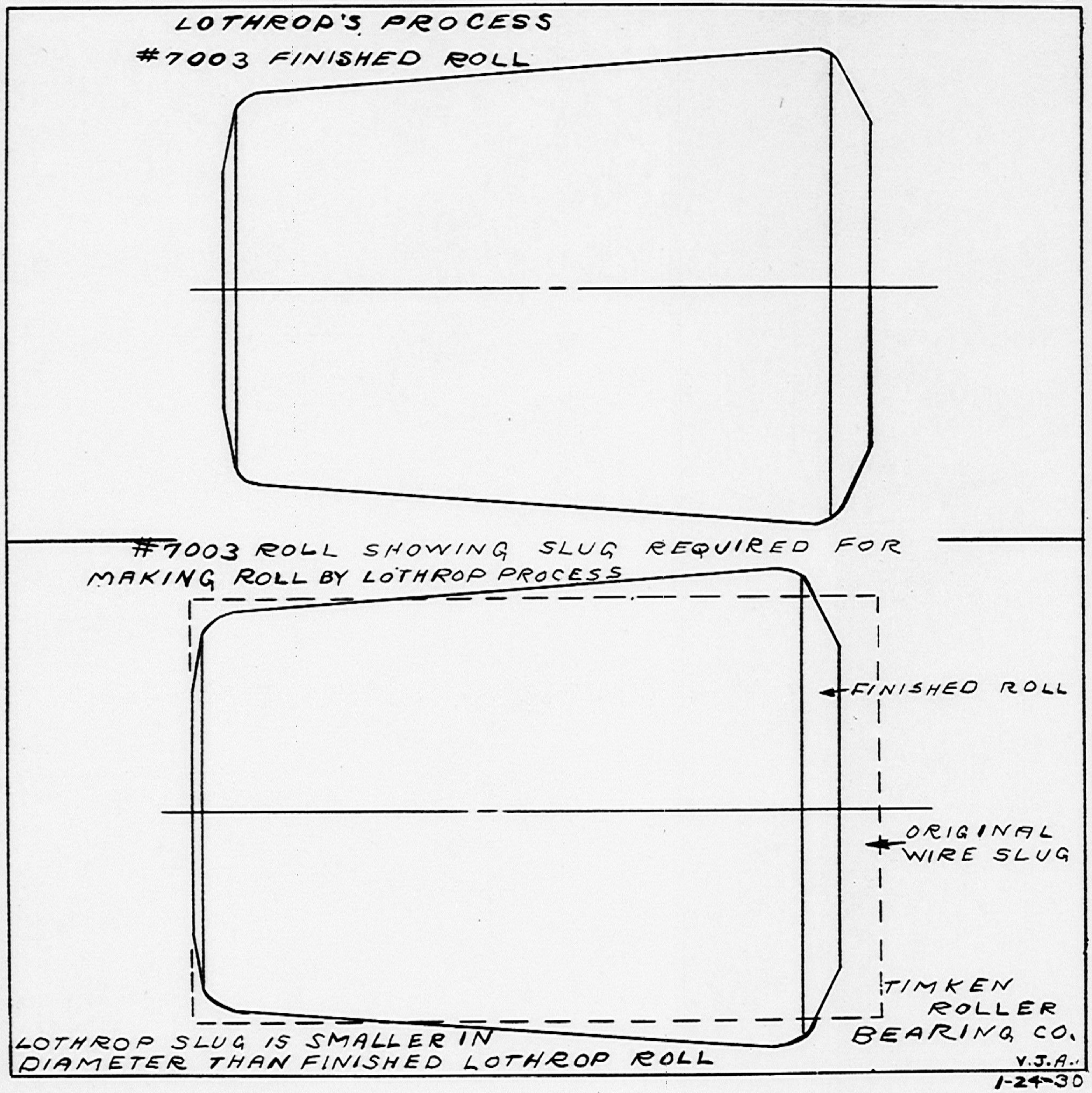
TIMKEN ROLLER
BEARING CO.
V.J.A.
1-23-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

PLAINTIFFS EXHIBIT #1
SHEET #28



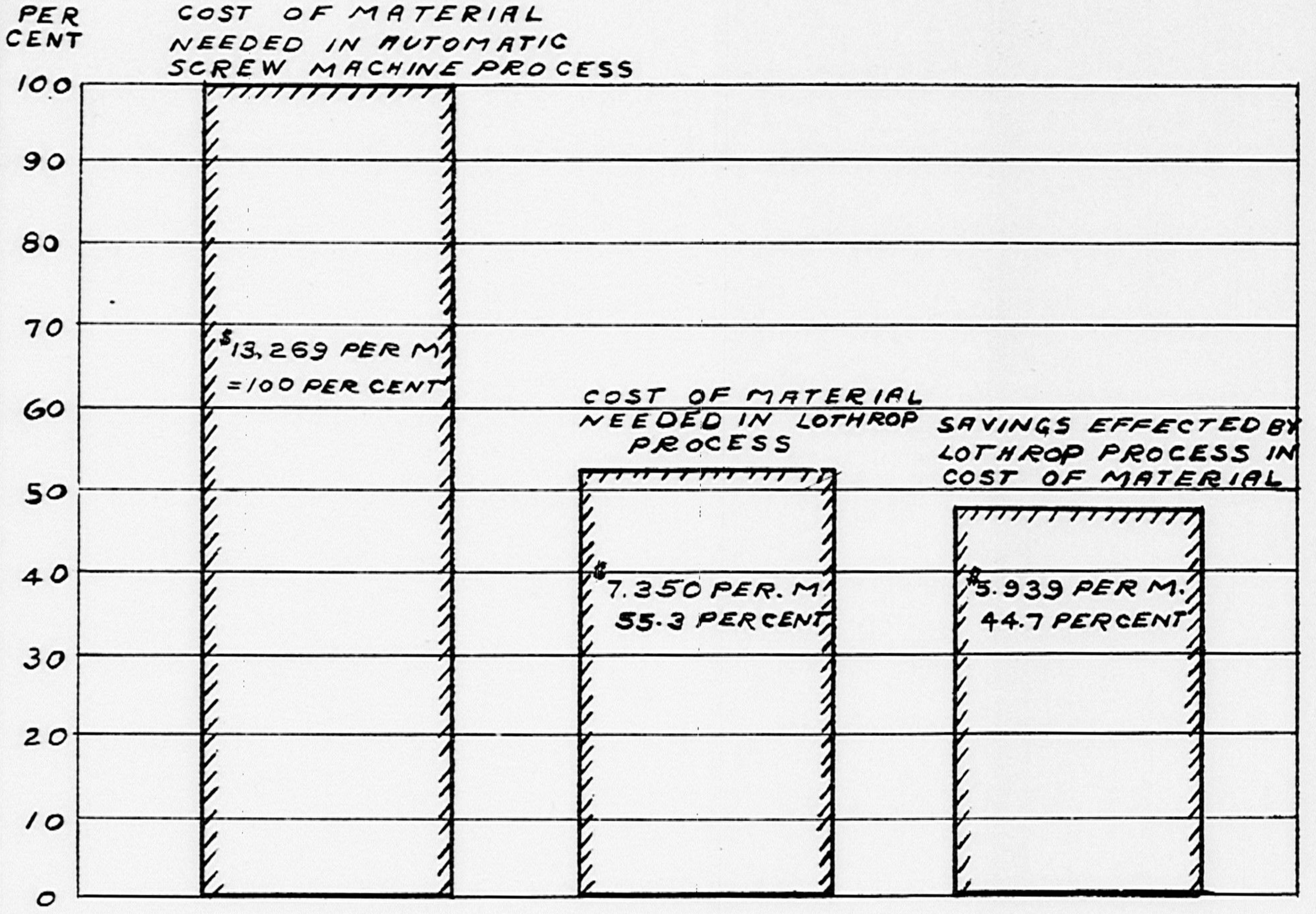
PLAINTIFF'S EXHIBIT 4
SHEET #29


LOTHROP'S PROCESS
#7003 FINISHED ROLL
#7003 ROLL SHOWING SLUG REQUIRED FOR MAKING ROLL BY LOTHROP PROCESS
FINISHED ROLL
ORIGINAL WIRE SLUG
LOTHROP SLUG IS SMALLER IN DIAMETER THAN FINISHED LOTHROP ROLL
TIMKEN ROLLER BEARING CO.
V.J.A.
1-24-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

SHEET #30
PLAINTIFFS EXHIBIT 4

COMPARISON OF MATERIAL COST
FOR #7003 ROLL



LOTHROP SAVES 44.7 PER CENT OF MATERIAL COST

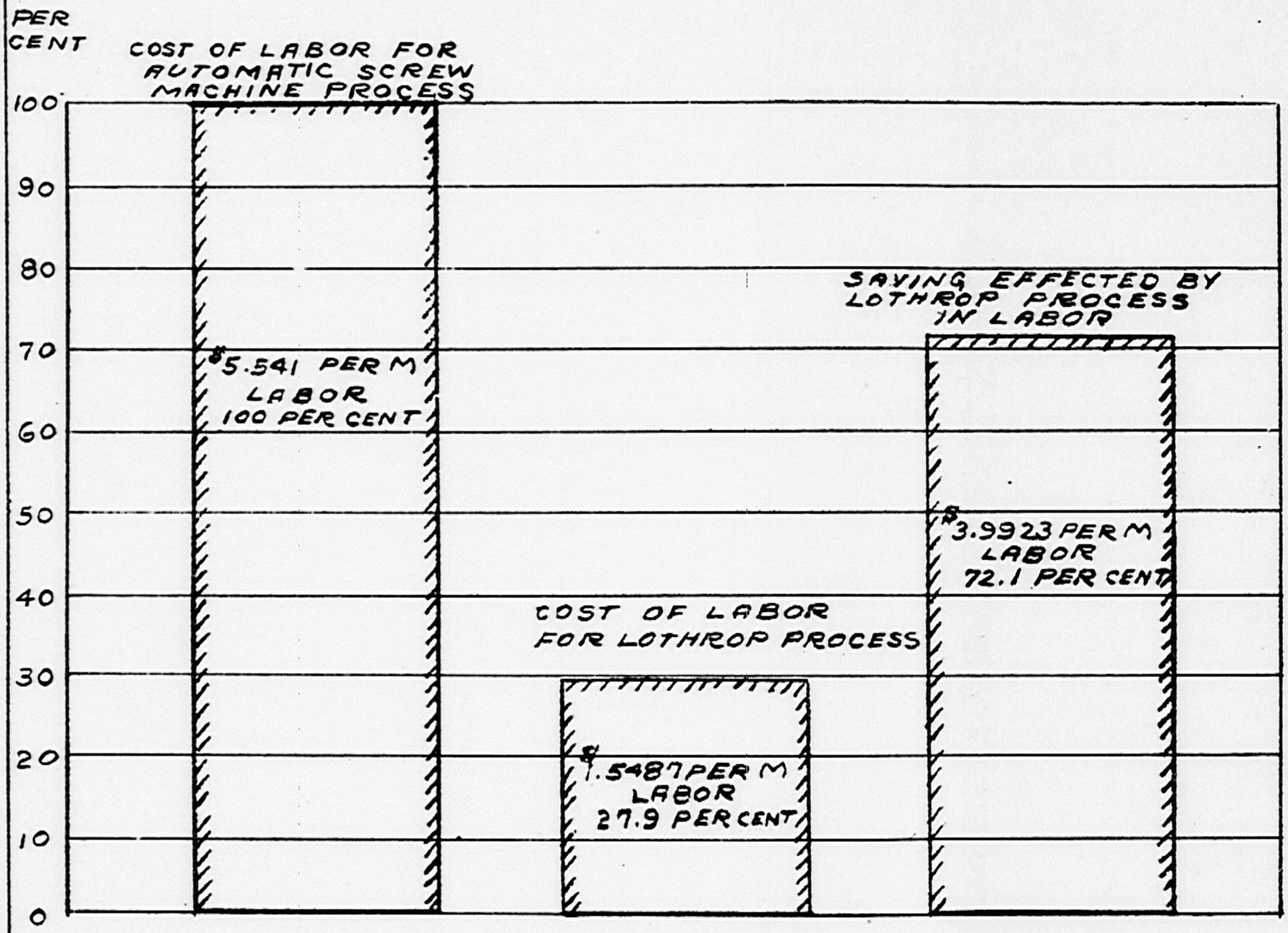
TIMKEN ROLLER BEARING CO.

V.J.A.
1-24-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants.
Thomas E. Robertson etc.

SHEET #31
PLAINTIFFS EXHIBIT 4

COMPARISON OF LABOR COSTS
FOR #7003 GREEN ROLL

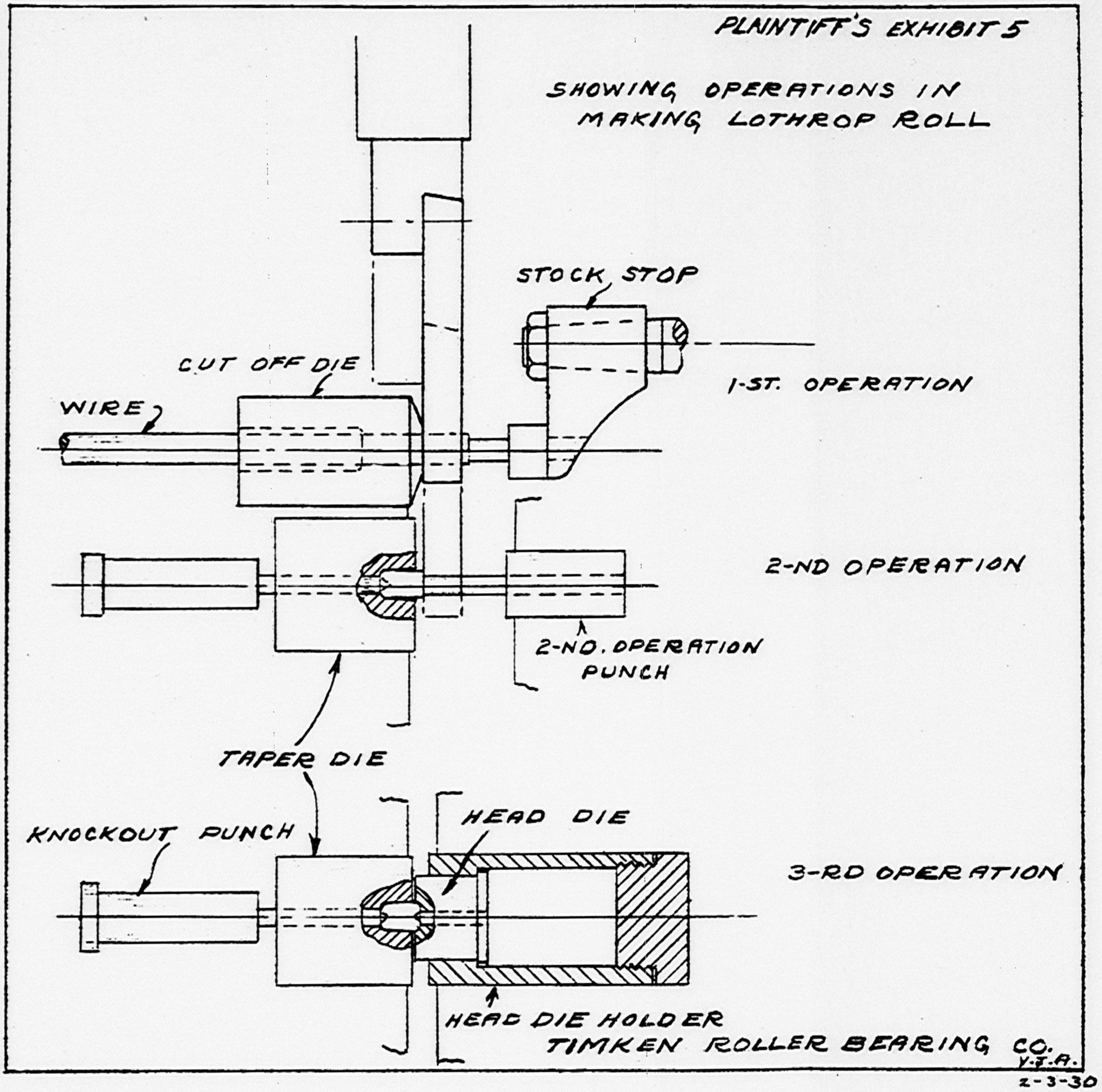


LOTHROP SAVES 72.1 PER CENT ON LABOR

TIMKEN ROLLER BEARING CO

V.J.A.
1-24-30

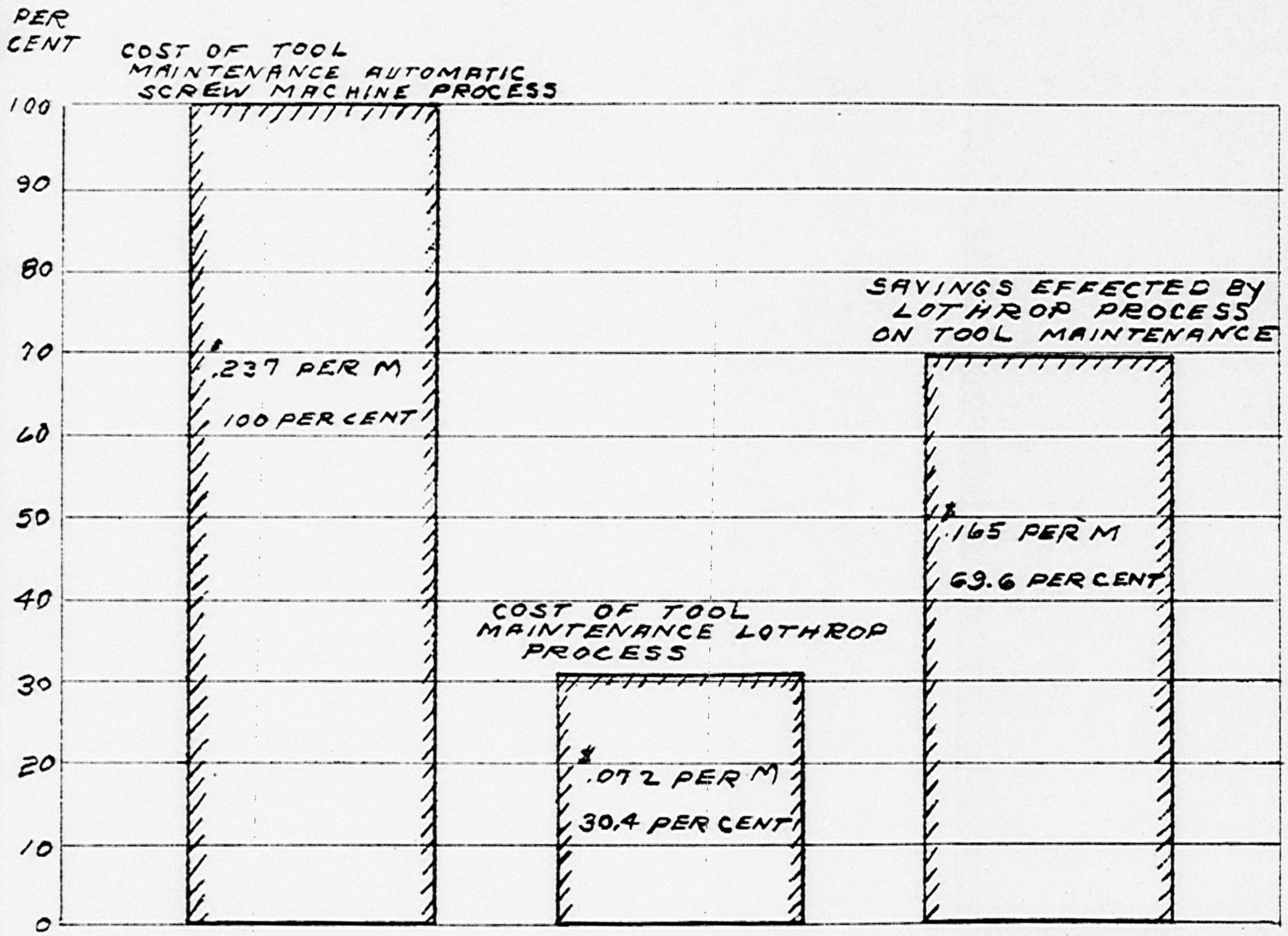
No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.



No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

PLAINTIFFS EXHIBIT 5

COST OF TOOL MAINTENANCE FOR 1000 ROLLS AUTOMATIC SCREW MACHINE AND LATHROP PROCESSES



LOTHROP SAVES 69.6 PER CENT ON TOOL MAINTENANCE

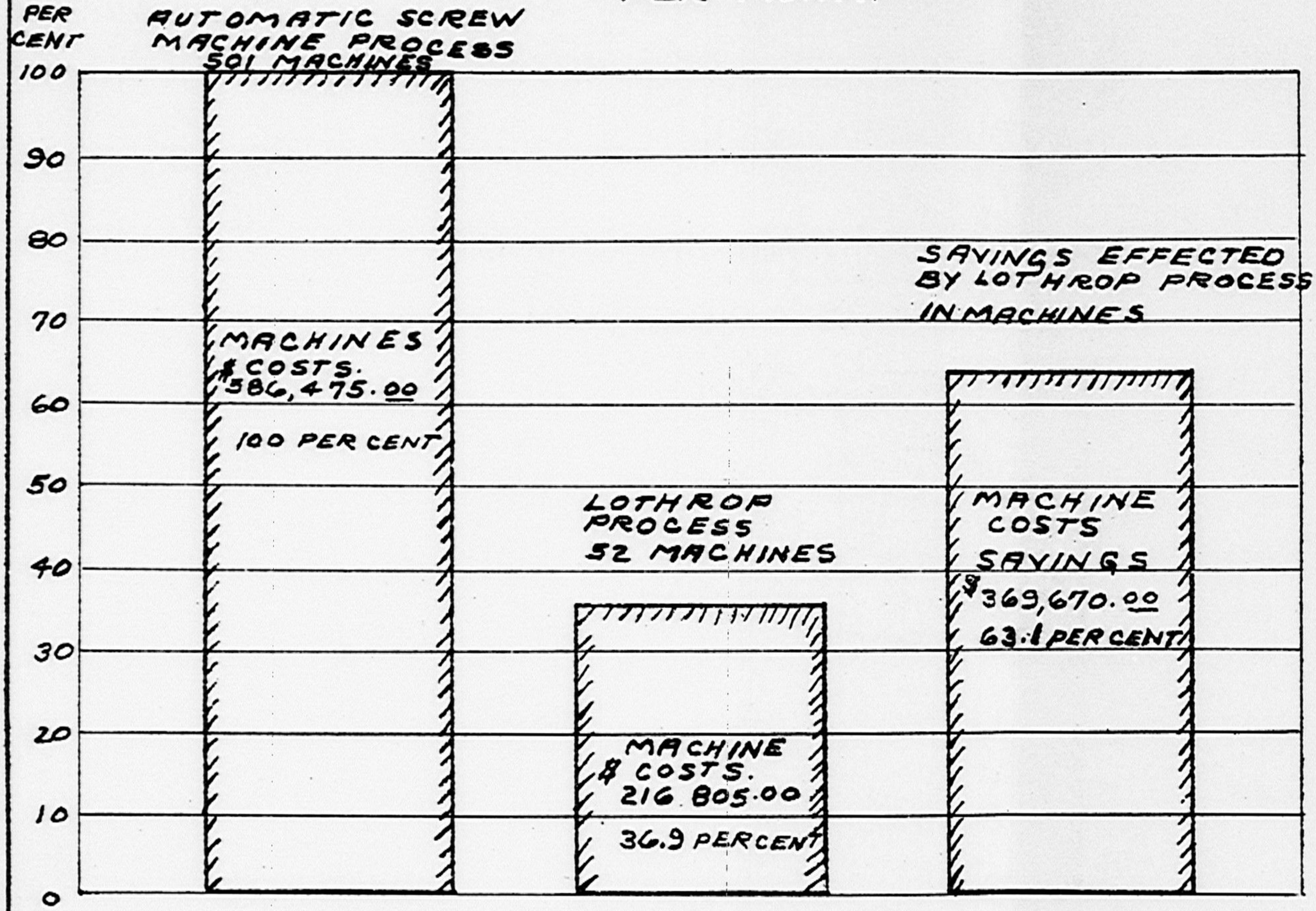
TIMKEN ROLLER BEARING CO.

V.J.A.
2-3-30

No. 5300
Marcus T. Lothrop etal.,
vs. Appellants,
Thomas E. Robertson etc.

PLAINTIFF'S EXHIBIT 5

COMPARISON - COST OF MACHINERY REQUIRED
AUTOMATIC SCREW MACHINE
AND LOTHROP PROCESSES.
FOR MAKING 90.559.859 ROLLS
PER MONTH



LOTHROP SAVES 63.1 OF MACHINE COSTS

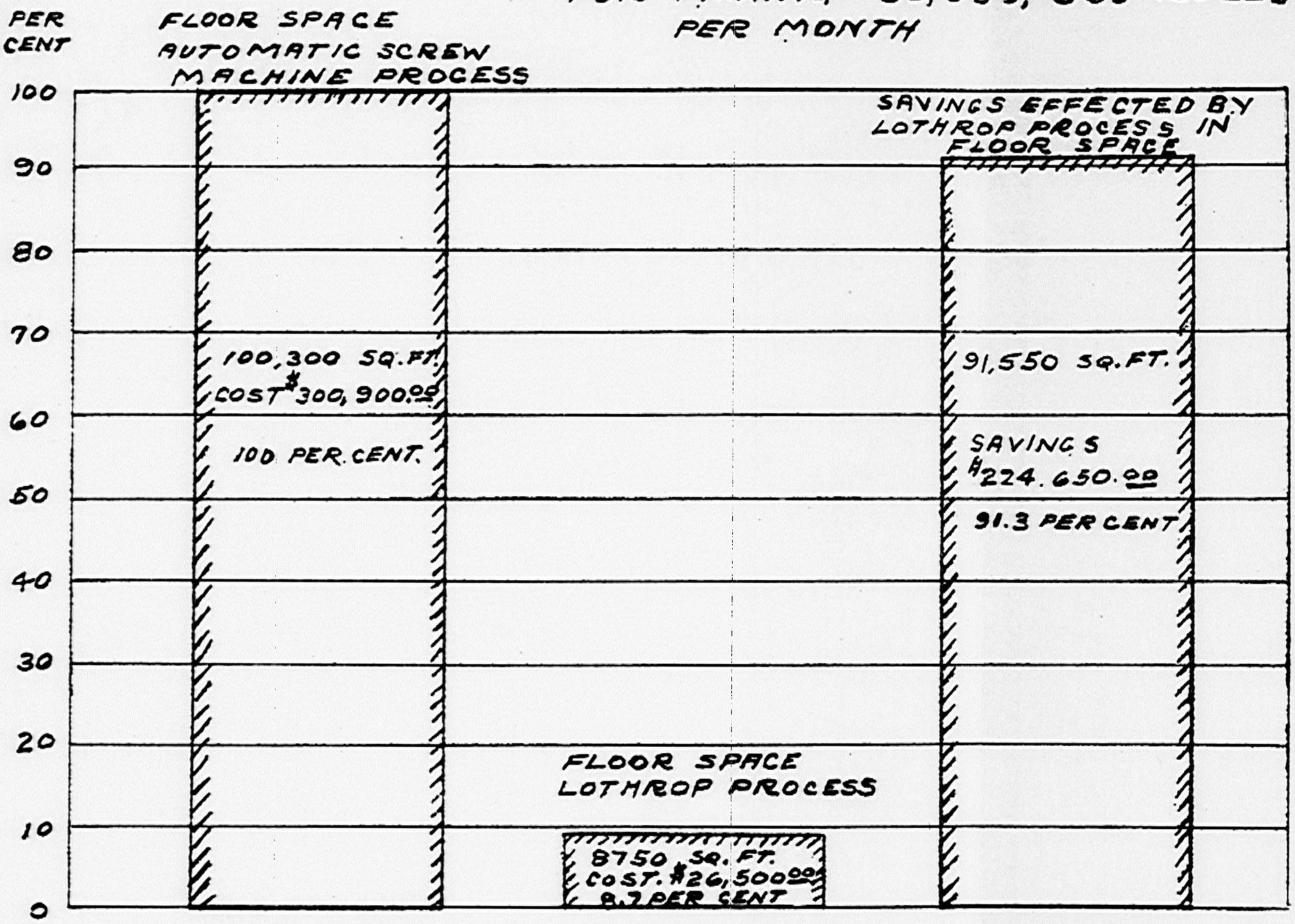
TIMKEN ROLLER BEARING CO.

V.S.A.
1-17-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

PLAINTIFFS EXHIBIT 5

COMPARISON OF FLOOR SPACE FOR MACHINERY AUTOMATIC SCREW MACAINE AND LOTHROP PROCESSES. FOR MAKING 90,559,859 ROLLS PER MONTH



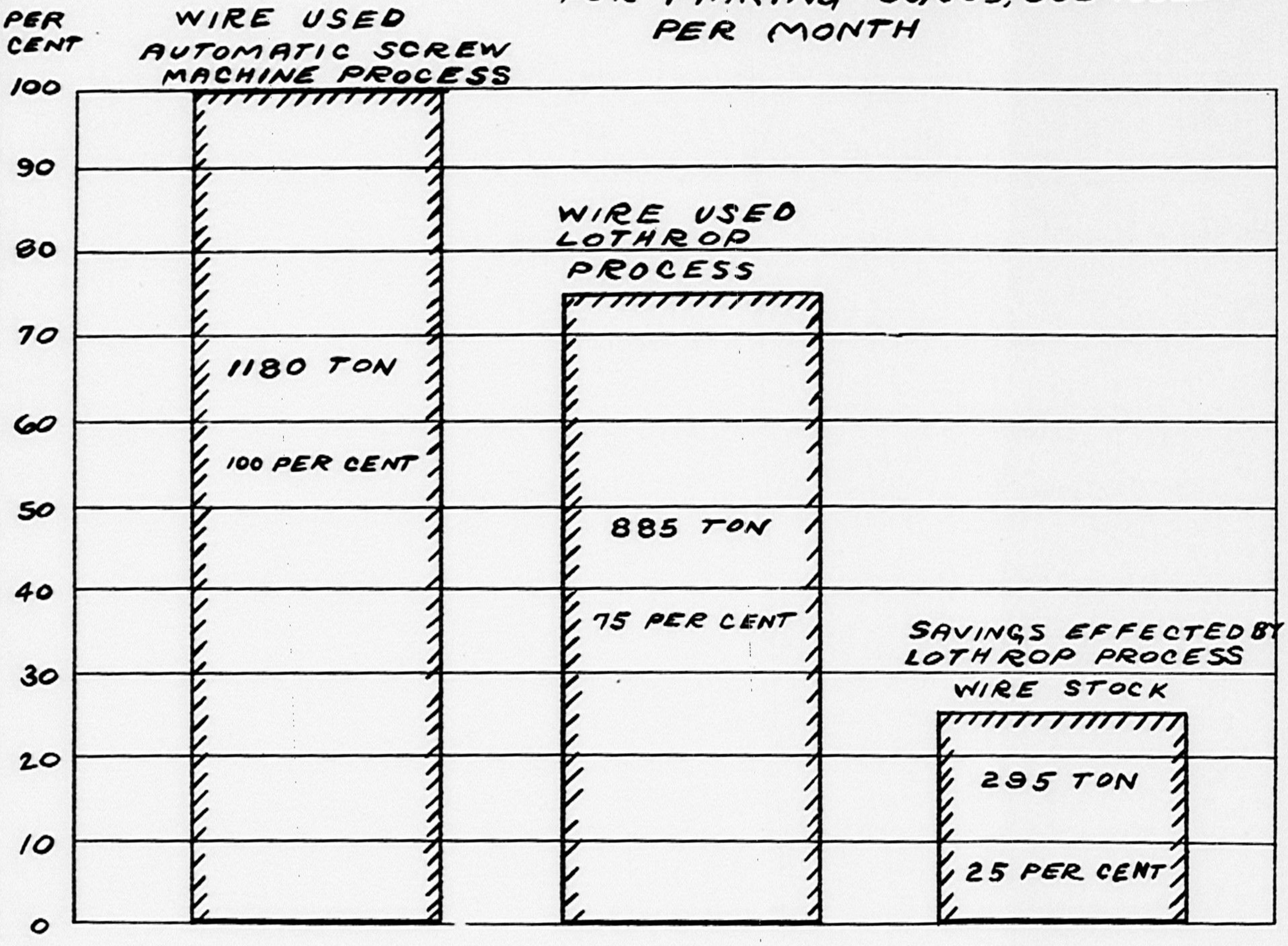
LOTHROP SAVES 91.3 PER CENT ON FLOOR SPACE

TIMKEN ROLLER BEARING CO.

V.J.A
1-17-30

PLAINTIFF'S EXHIBIT 5

COMPARISON OF WIRE STOCK USED AUTOMATIC SCREW MACHINE AND LOTHROP PROCESSES FOR MAKING 90,559,859 ROLLS PER MONTH



LOTHROP SAVES 25 PER CENT OF WIRE STOCK

TIMKEN ROLLER BEARING CO.

V.J.A.
1-18-30

No. 5300
Marcus T. Lothrop et al.,
vs. Appellants,
Thomas E. Robertson etc.

41 Duplicate.

Department of Commerce, U. S. Patent Office.

Serial Number 530643.

Series of 1925*a*.

Jan. 20, 1922.
(Filing date.)

Address only Commissioner of Patents, Washington, D. C.

Applicant: Lothrop, Marcus T., Canton, Ohio.
Invention: Rollers for Roller Bearings.
Carr & Carr, Boatmens Bank Bldg., St. Louis, Mo.
Case initially assigned to division 45.

The petition, specification, oath, drawing, and first fee of twenty dollars of your application for Patent above identified are received.

Respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents

Form 2-030*a*. 11-9231. (See other side.)
Credits on Drafts or Checks are subject to collection.

42 Your application will be considered in its orde and you will be duly advised as to the examinatio thereof.

(Here follow photolithographed pages 43 to 71, inclusive.)

72 In the Supreme Court of the District of Columbia.

In Equity.

No. 48,859.

MARCUS T. LOTHROP and THE TIMKEN ROLLER BEARING COMPANY, Plaintiffs,

vs.

THOMAS E. ROBERTSON, Commissioner of Patents, Defendant.

Answer to the Bill of Complaint.

Filed Oct. 12, 1928.

To the Honorable The Judges of the Supreme Court of the District of Columbia:

1. Defendant answering the bill of complaint admits the citizenship and residence of the parties hereto to be stated in paragraph 1 of the bill.

2. Defendant admits that he is an official resident of the District of Columbia and is sued as Commissioner of Patents, but states that he is a legal resident of Chevy Chase, Maryland.

3. Defendant admits the allegations of paragraph 3.

4. Defendant admits that on the 28th day of July 1921, Marcus T. Lothrop made application for letters patent, Serial No. 488,260, as specified, but denies that he is entitled to a patent for the claims set forth in the application in view of prior patents hereinafter mentioned. Defendant has no knowledge of the remaining allegations of paragraph 4 except as informed by the bill, and therefore denies them.

5. Defendant admits that application, Serial No. 488,260 contains claims 1 to 13, inclusive, as set forth in paragraph 5, but denies that the said claims are patentable to the applicant Lothrop in view of the following patents: 73

Wellman, 422,557, March 4, 1890.
Holden, 632,462, Sept. 5, 1899.
Lockwood, 1,152,110, Aug. 31, 1915.
Renault, (French), 491,251, May 28, 1919.
Wingquist, (Swedish), 50,955, of 1918.
Palmgren, (Swedish), 47,365, of 1919.

and other patents and publications which may be noticed hereafter and may be referred to at the hearing of this cause.

6. Defendant admits the allegations of paragraph 6.

7. Defendant admits, for the purpose of this suit, the allegations of paragraph 7.

8. Defendant admits that on January 20, 1922, Marcus T. Lothrop made application for letters patent, Serial No. 530,643, as specified more fully in paragraph 8, but denies that he is entitled to a patent for the claims set forth in the application. Defendant has no knowledge of the remaining allegations of paragraph 8, except as informed by the bill, and therefore leaves plaintiffs to their proofs.

9. Defendant admits that application, Serial No. 530,643, contains claims 1 to 20, inclusive, as set forth in paragraph 9, but denies that the said claims are patentable to the applicant Lothrop in view of the following patents recited in the decision of the Board of Appeals, viz:

Wellman, 422,557, March 4, 1890.
Griffin, 703,405, July 1, 1902.
Lockwood, 1,152,110, Aug. 31, 1915.
Miller, 1,392,019, Sept. 27, 1921.
Huther, 1,402,071, Jan. 3, 1922.
Renault, (French), 491,251, May 28, 1919.
Wingquist, (Swedish), 50,955, of 1918.
Palmgren, (Swedish), 47,365, of 1919.

and other patents and publications which may be noticed hereafter and may be referred to at the hearing of this cause.

10. Defendant admits the allegations of paragraph 10.

11. Defendant admits, for the purpose of this suit, the allegations of paragraph 11.

74 12. Defendant admits that Section 4915 of the Revised Statutes provides that the plaintiff shall pay all expenses of the suit.

13. Defendant denies that the action of the Primary Examiner of the Patent Office, holding that the process and product constituted a single invention, was prejudicial to the plaintiffs.

And further answering, defendant denies each and every allegation of the bill of complaint not herein specifically and sufficiently denied or admitted, and prays that the plaintiffs' bill of complaint be dismissed.

Wherefore defendant prays that he be hence dismissed with all costs and expenses of the proceedings against the plaintiffs, as required by Section 4915 R. S.

THOMAS E. ROBERTSON,
Commissioner of Patents.

T. A. HOSTETLER,
Solicitor for the Patent Office,
Attorney for Defendant.

75 DISTRICT OF COLUMBIA,
City of Washington, ss:

I, Thomas E. Robertson, depose and say that I have read the above answer by me subscribed and know the contents thereof; and that the statements of facts therein made as upon personal knowledge are true, and those made upon information and belief I believe to be true.

THOMAS E. ROBERTSON.

Subscribed and sworn to before me this 13 day of October, 1928.

[SEAL.] FANNIE W. SCHRIDER,
Notary Public, D. C.

76 *Stipulation.*

Filed Jul. 19, 1930.

* * * * * * *

It is hereby stipulated that the following Exhibits be attached to the Answer to the Bill of Complaint and filed as of that date, to become a part of the transcript of record, viz:

Wellman	patent,	422,557,	Mar. 4, 1890.
Holden	"	632,462,	Sept. 5, 1899.
Griffin	"	703,405,	July 1, 1902.
Lockwood	"	1,152,110,	Aug. 31, 1915.
Miller	"	1,392,019,	Sept. 27, 1921.
Huther	"	1,402,071,	Jan. 3, 1922.
Renalt	"	(French), 491,251	May 28, 1919.
Palmgren	"	(Swedish), 47,365	of 1919.

SAMUEL HERRICK,
Attorney for Plaintiffs.
T. A. HOSTETLER,
Attorney for Defendant.

July 18, 1930.

33

(No Model.)

S. T. WELLMAN.

APPARATUS FOR FORGING CAR AXLES.

No. 422,557. Patented Mar. 4, 1890.

Fig. 5.

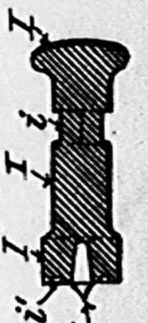


Fig. 1.

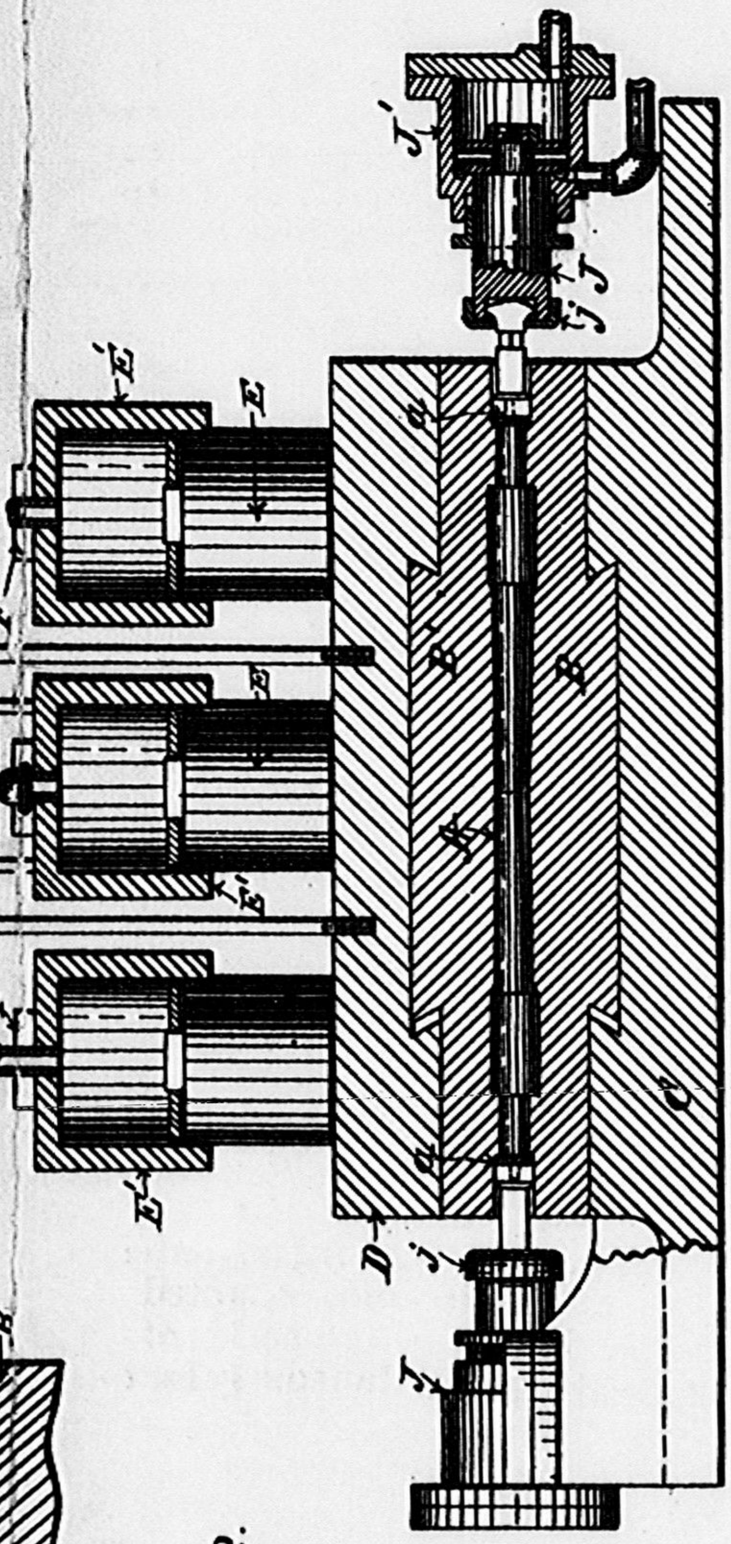


Fig. 3.

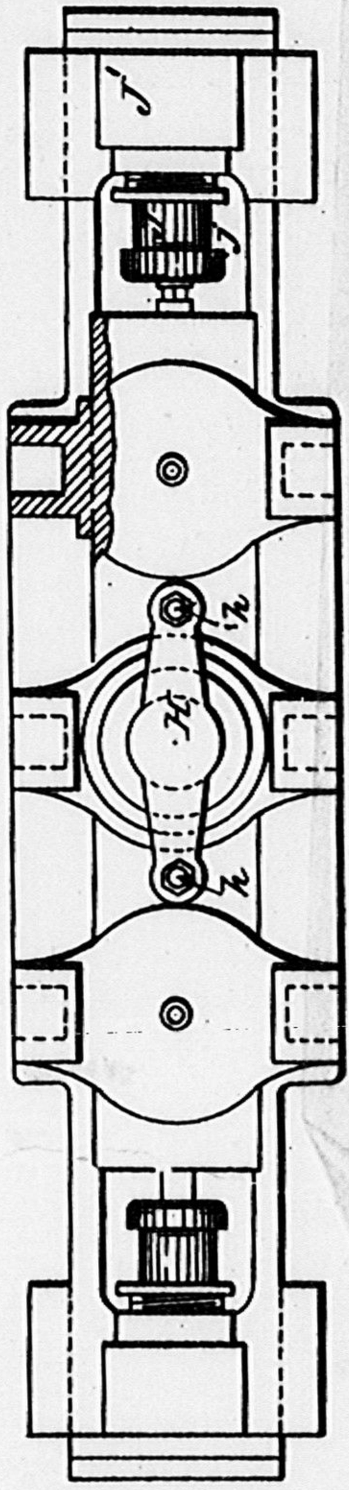


Fig. 6

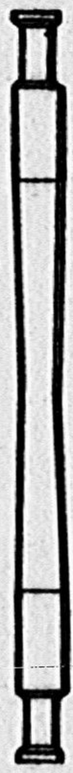


Fig. 7

Fig. 4.

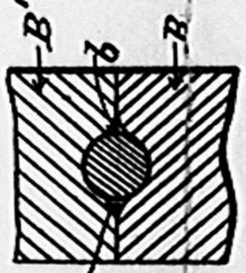
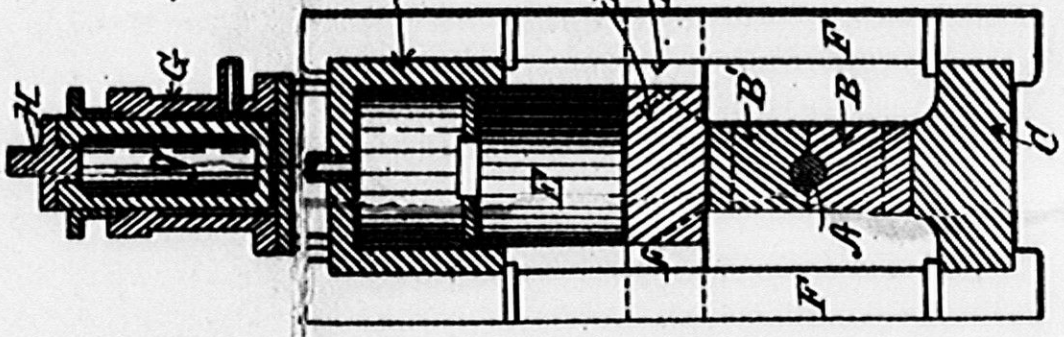


Fig. 2.



WITNESSES.
W. R. Edelen.
Geo. W. King

INVENTOR.
Samuel T. Wellman

By Leggett and Leggett
ATTORNEY.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

SAMUEL T. WELLMAN, OF CLEVELAND, OHIO.

APPARATUS FOR FORGING CAR-AXLES.

SPECIFICATION forming part of Letters Patent No. 422,557, dated March 4, 1890.

Application filed December 26, 1888. Renewed September 9, 1889. Serial No. 323,350. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. WELLMAN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Apparatus for Manufacturing Car-Axles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in apparatus for manufacturing car-axles; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation, partly in section. Fig. 2 is an end elevation, in transverse section, through the longitudinal center of the machine. Fig. 3 is a plan. Fig. 4 is an enlarged cross-section of dies B B′. Fig. 5 is an enlarged detail of an upsetting-die. Figs. 6 and 7 are respectively side elevation and plan of blanks for car-axles.

My improved apparatus is for rounding or forging blanks previously prepared, such blanks having two parallel sides, as shown in Fig. 7, the blanks being of such variable width approximately, as shown in Fig. 6, that will distribute the metal lengthwise of the blank, the same as in the finished forging A, the latter being shown between the forging-dies B B′. The lower die B is stationary, being secured to the bed-plate C. The upper die B′ is secured to the vertically-reciprocating die-head D, the latter having attached the plungers E of the respective water-cylinders E′. These three cylinders are each supported by heavy side pieces or columns F, the one member *f* of each serving as a guide for head D. The three cylinders E′ are connected in the same system of water-pipes, so that they operate simultaneously. These three rams or cylinders are employed for depressing head D, to avoid constructing this head of such cumbersome proportions as would be necessary in case a single larger ram were employed for the purpose.

Located above the central cylinder E′, and supported from the same, is a smaller water-cylinder G. The plunger *g* thereof connects with cross-head H. The latter in turn is connected by means of rods *h* with head D aforesaid. By operating the upper ram die B′, head D, and the three plungers E are elevated.

The dies B B′ internally are adapted to fit the finished forgings A, except that the internal corners of the dies at *b* are cut away, as shown more clearly in Fig. 4. The recesses thus formed by cutting away the corners of the dies receive the metal that is forced laterally in breaking down the blank with the first closing of the dies. Without such recesses fins would be formed that would prevent the dies from closing. Outside the end collars *a* of the axle the bore of the dies is cylindrical to the ends thereof and of the same diameter as the end collar *a*.

By operating dies B B′ the axle is not drawn—that is to say, is not elongated—except at or near the ends of the axle; but at the respective ends the tendency to elongate is such that without other appliances than the dies aforesaid said collars *a* would not be forged full and sharp and the ends of the forging would be quite uneven or ragged. To avoid this upsetting-dies I are provided, the heads I′ thereof being adapted to fit internally the end sections of dies B B′ when these are closed. The enlarged rounded ends I² of the upsetting-dies enter corresponding sockets in the ends of plungers J of the double-acting rams J′. These latter rams are mounted, as shown, on the respective ends of bed-plates C, the axes of these rams being coincident with the axes of dies B B′. Dies I are held to their seats in the plungers by removable caps *j*. These caps fit so loosely, and by reason of the rounded ends aforesaid, that when the dies B B′ are opened the free end of the upsetting-dies may be raised a short distance without cramping in their seats in the plungers.

The length of dies I is such that with plungers J thrust forward their full throw the axle is upset to just the length required. For axles of different lengths or diameters the larger dies and the upsetting-dies are changed, others of the required dimensions being substituted.

The collars *a* of the axle may be made longer without changing the larger dies by providing a blank with more metal at the ends and substituting shorter upsetting-dies.

For turning the axle on its axis between the strokes of dies B B′, dies I have sections i, squared or otherwise prepared to receive a wrench or other appliance for turning the same, and the faces of these upsetting-dies have depressions or projections—for instance, holes i', (shown in Fig. 5,)—for engaging the ends of the axle to cause the latter to rotate with the rotation of the upsetting-dies.

In operating the apparatus the blank is placed edgewise between dies B B′ and the dies are closed. As this occurs, dies I are brought forward their full stroke and are held in such position during the successive strokes of the larger die. The first stroke of the larger dies breaks down the blank and fairly shapes the upper and lower sections thereof, but of course leaves ridges along the sides of the axle, where the edges of the dies are cut away, as aforesaid. Next, the axle, by means of dies I, is given a quarter-turn to bring these ridges top and bottom, and as the one ridge is turned down into die B the axle must necessarily raise a trifle; hence the provision aforesaid that allows die I to tilt upward. A few more strokes of dies B B′, the axle meantime being rotated between strokes, finishes the work, the entire operation requiring but a few moments of time.

I may also add that the work is more uniform and has a much better finish than when done, as heretofore, under a forging-hammer.

The conical points i^2 are for centering the shaft for subsequent finishing in a lathe.

What I claim is—

1. In apparatus for forging axles, the combination of forging-dies adapted to receive the entire blank with a series of hydraulic rams operating simultaneously for closing the dies and a separate ram for opening the dies, and thereby reversing the plungers of the rams that close the dies, substantially as set forth.

2. The combination, with forging-dies, substantially as indicated, of upsetting-dies operating internally in the end sections of the forging-dies and rams for operating the respective upsetting-dies, the latter being connected with the rams by means of universal joints, whereby the upsetting-dies may be rotated on their axes and at the same time tilted out of the line with the actuating-rams, substantially as set forth.

3. The combination, with forging-dies, substantially as indicated, of interchangeable upsetting-dies operating in the end sections of the forging-dies and rams for operating the upsetting-dies, the length of the latter being such as will gage the length of the axle, meantime the rams for actuating the same are operated full throw, substantially as set forth.

4. The combination, with forging-dies adapted to receive the blank bodily, of upsetting-dies and rams for operating the latter, the arrangement being substantially as indicated, such upsetting-dies having projections or depressions on their faces for interlocking with the forging, whereby the latter is turned on its axis by rotating the upsetting-dies, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 8th day of December, 1888.

SAMUEL T. WELLMAN.

Witnesses:
CHAS. H. DORER,
ALBERT E. LYNCH.

36

No. 632,462. Patented Sept. 5, 1899.

H. C. L. HOLDEN.

PROCESS OF MAKING CRUSHER GAGES.

(Application filed Feb. 28, 1899.)

(No Model.)

Fig. 1.

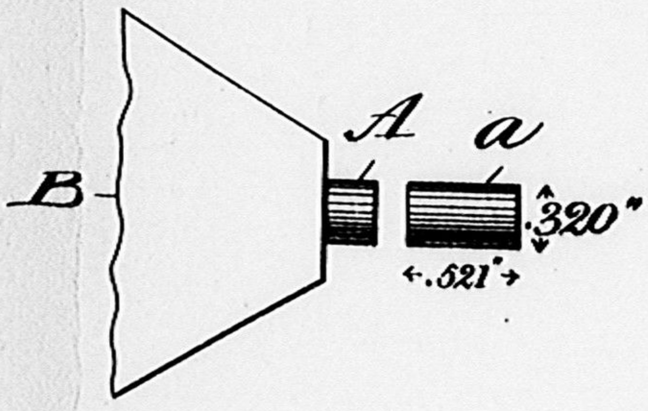


Fig. 2.

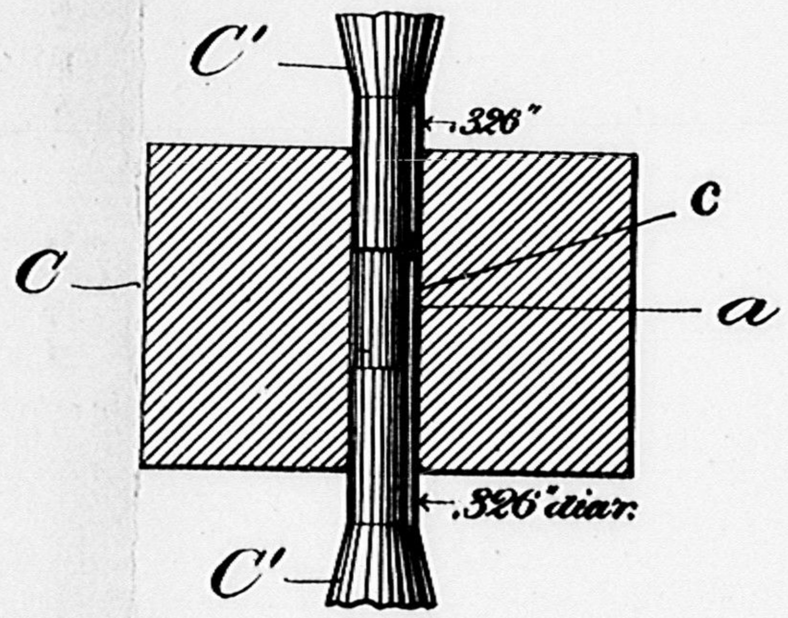
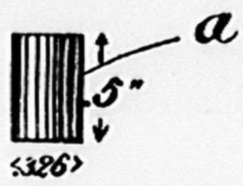


Fig. 3.



Witnesses
J. D. Kingsbury
Bluford W. Brackett

Inventor.
Henry C. L. Holden
By Whitaker & Prevost Attys.

UNITED STATES PATENT OFFICE.

HENRY CAPEL LOFFT HOLDEN, OF LONDON, ENGLAND.

PROCESS OF MAKING CRUSHER-GAGES.

SPECIFICATION forming part of Letters Patent No. 632,462, dated September 5, 1899.

Application filed February 28, 1899. Serial No. 707,220. (No model.)

To all whom it may concern:

Be it known that I, HENRY CAPEL LOFFT HOLDEN, a subject of the Queen of Great Britain, residing at Woolwich, London, England, have invented a new and useful improved process for the manufacture of copper cylinders such as are employed in crusher-gages for registering the pressure developed in ordnance and firearms generally, (for which I have applied for a patent in Great Britain, No. 17,993, dated August 22, 1898; in Germany, dated December 9, 1898, and in France, dated February 20, 1899;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of copper cylinders such as are employed in what are known as crusher-gages used for the determination of pressures developed in ordnance and firearms generally, and the efficiency of which depends mainly upon the accuracy of the said copper cylinders.

In the accompanying drawings, which illustrate my invention, Figure 1 represents a portion of a lathe, showing a section of copper rod and one cylinder-blank cut from the same. Fig. 2 represents a perforated die and two punches in the act of compressing a cylinder-blank longitudinally and expanding it laterally to give it the correct shape when finished. Fig. 3 represents the finished cylinder.

On the drawings I have indicated the dimensions of the finished cylinder as it is used in England, and the approximate dimensions of the blank for making this cylinder.

Hitherto the production of such cylinders has been confined to hand processes carried out by skilled mechanics, the said cylinders having been turned from a copper rod to correct diameters in a lathe and afterward finished by hand to the correct length, both of which operations are slow and expensive, and even with the greatest care it has been very difficult to obtain the required degree of accuracy.

The object of my invention is to insure the greatest accuracy in dimensions and at the same time effect great economy and rapidity of production, and this I accomplish by the process hereinafter described, which can be carried out by unskilled labor.

In carrying out my process a round copper rod, of a diameter slightly smaller than that which the finished copper cylinders are to have, is cut into lengths in an automatic cutting-off lathe or machine of any usual or preferred construction, the length of each piece when cut off being such that its weight is very slightly greater than the weight which the completed copper cylinder is to possess, and then the weight of each piece is adjusted more or less exactly to the standard weight corresponding with that of the finished cylinder by filing it or by grinding it against an emery or other wheel, this operation requiring no care except so far as the weight is concerned. The pieces of copper, thus accurately adjusted as to weight, are now individually compressed between dies (the female of which is cylindrical and has exactly the diameter of the finished cylinder) and subjected to such pressure that the copper flows and fills the female die, with the result that the diameter and length are corrected, the latter being dependent upon the correct diameter and weight.

In Fig. 1, A represents the copper rod from which the cylinder-blanks, one of which is shown at *a*, are cut, a portion of the lathe being indicated at B.

In Fig. 2 I have illustrated one form of apparatus for compressing the cylinder-blank *a* longitudinally and expanding it laterally. In this figure, C represents a female die having an aperture *c* therethrough of exactly the diameter of the finished cylinder, and C′ C′ represent punches working in said aperture and adapted to compress the cylinder-blank between them.

The next and final step in the process is to soften the copper cylinders, and this is effected by heating them in a furnace (and preferably a muffle, so as to prevent as far as possible the contact of oxygen with the metal) to a temperature of, say, 1,000° Fahrenheit and then suddenly cooling them in water at a temperature of, say, 65° Fahrenheit or whatever temperature may be required to produce the desired annealing effect. A finished cylinder is shown at *a* in Fig. 3.

In practice it is found that the copper cylinders made by this process vary only very slightly from one another in their physical properties and are superior in this respect to those hitherto made by hand processes.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

The herein-described process of manufacturing copper cylinders for use in crusher-gages for registering pressures developed in ordnance and firearms, which consists in taking a copper rod of a diameter slightly less than the required diameter of the finished cylinders, severing therefrom pieces of such length that their weight is slightly greater than that required in the finished cylinders, removing portions of said pieces to reduce their weight exactly to that required in the finished cylinder, then compressing the pieces longitudinally and expanding them laterally to the required diameter, then softening the cylinders by heating them and cooling them in water, substantially as described.

HENRY CAPEL LOFFT HOLDEN.

Witnesses:
JOHN E. BOUSFIELD,
C. G. REDFERN.

No. 703,405. **Patented July 1, 1902.**

W. G. GRIFFIN.
ROLLER BEARING.

(Application filed Oct. 5, 1901.)

(No Model.) 2 Sheets—Sheet 1.

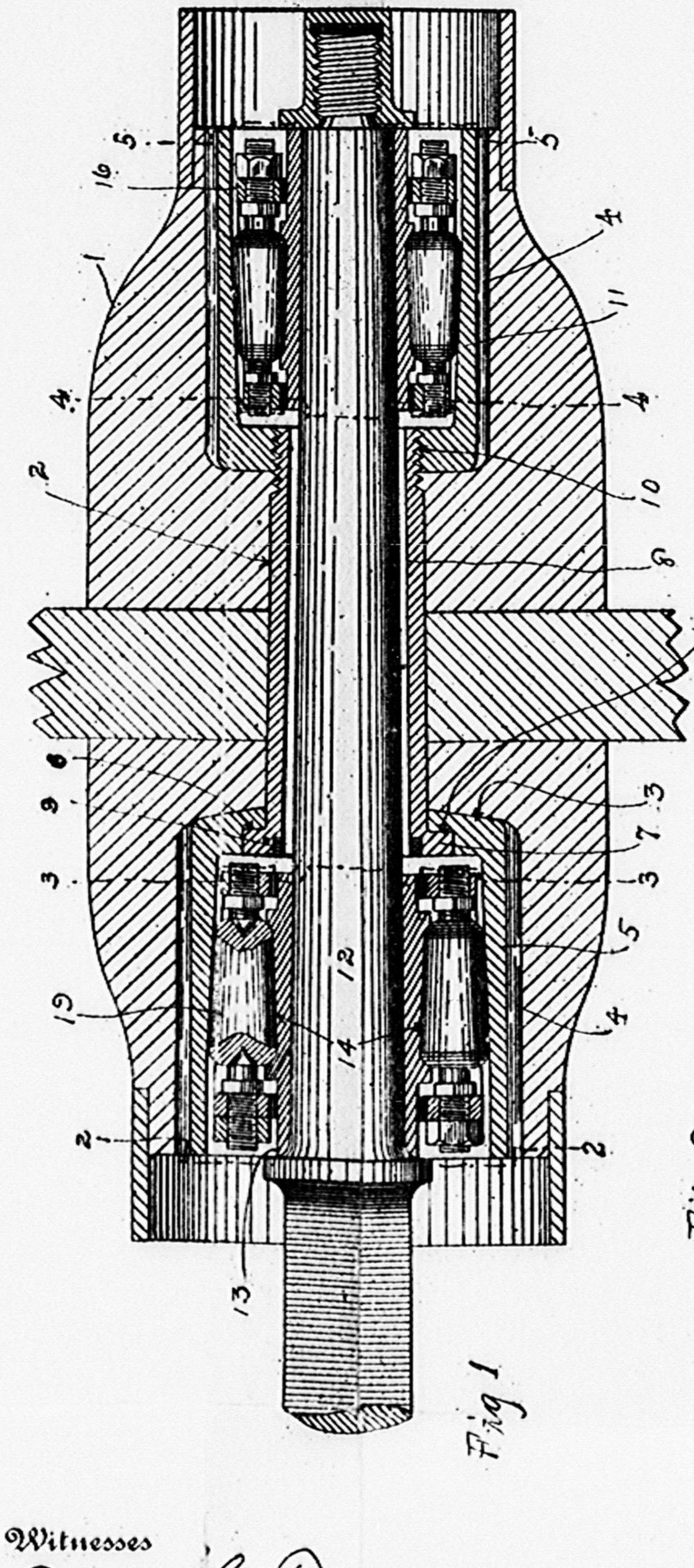


Fig 1

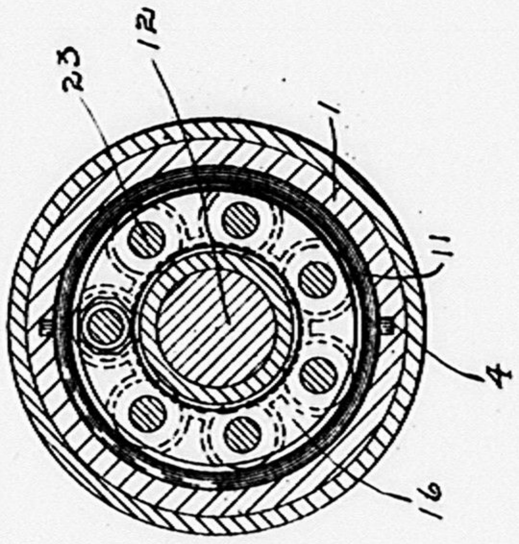


Fig 5

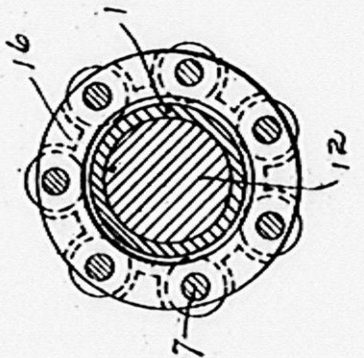


Fig 4

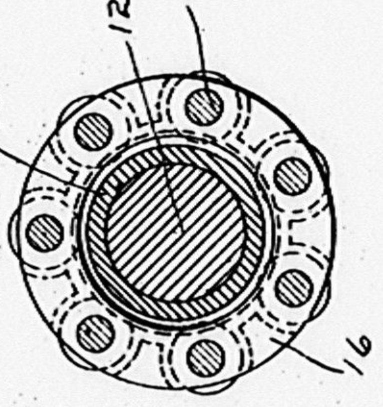


Fig 3

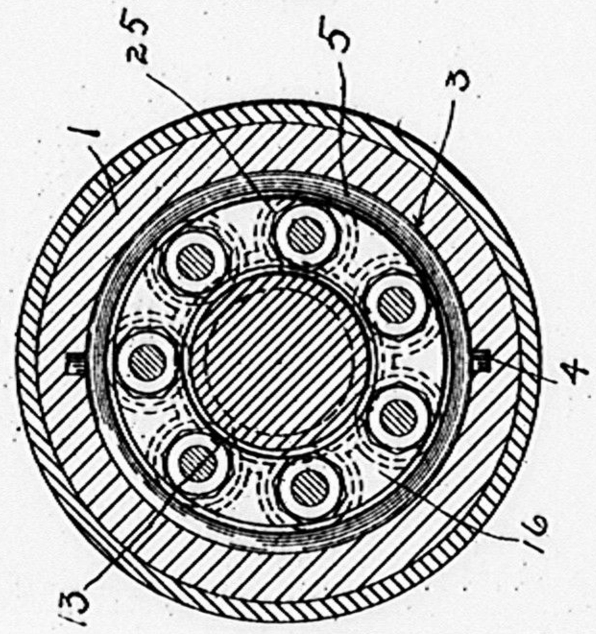


Fig 2

Witnesses
Grace L. Dunn
Fannie C. Ritchie

Inventor
William G. Griffin
By O'Farrell & Lawson
Attorneys

No. 703,405. Patented July 1, 1902.

W. G. GRIFFIN.

ROLLER BEARING.

(Application filed Oct. 5, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig 6

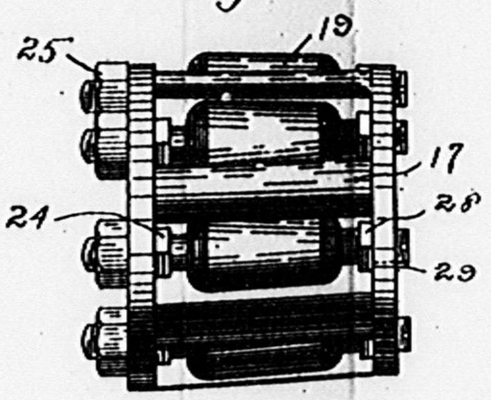


Fig 8

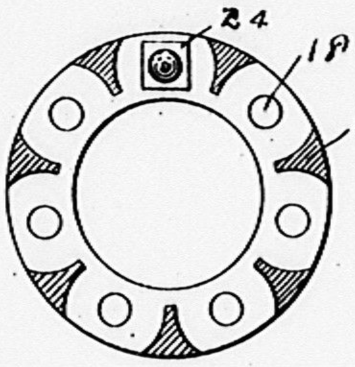
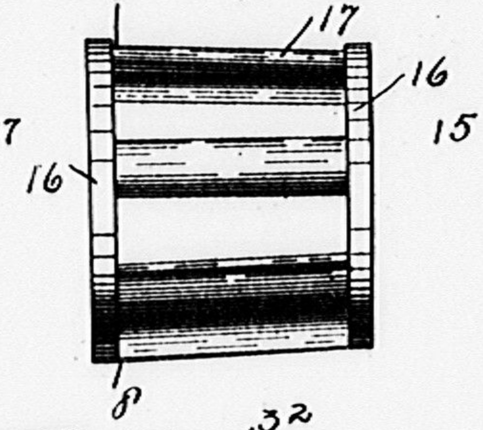


Fig 7



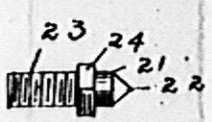


Fig 13.

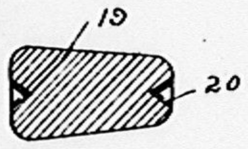


Fig 12

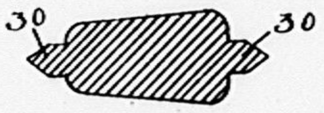


Fig 16

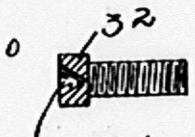


Fig 17

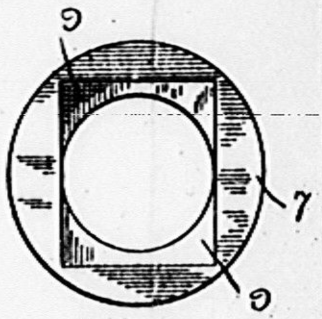


Fig 10

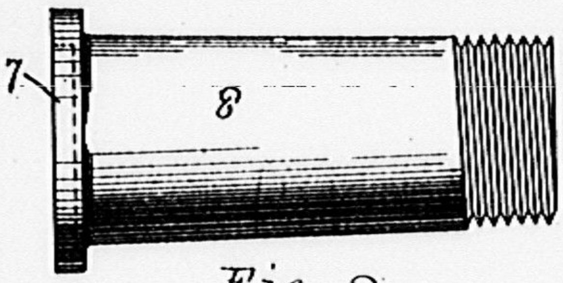


Fig 9

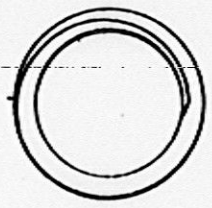


Fig 11

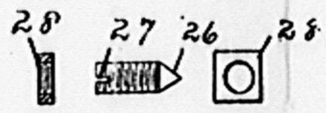


Fig 15

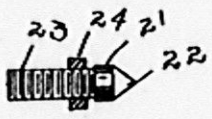


Fig 14

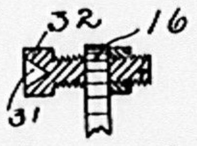


Fig 18

Inventor
William G. Griffin

Witnesses
Grace L. Dunn
Fannie C. Ritchie

By Farrell & Lawson
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM G. GRIFFIN, OF WASHINGTON, DISTRICT OF COLUMBIA.

ROLLER-BEARING.

SPECIFICATION forming part of Letters Patent No. 703,405, dated July 1, 1902.

Application filed October 5, 1901. Serial No. 77,691. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. GRIFFIN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Roller-Bearings, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in roller-bearings, and is more especially adapted for use in the hubs of vehicle-wheels. Its object is to provide a bearing of simple and durable construction which is compact in form and can be readily placed in position within the hubs of wheels of ordinary construction.

A further object is to provide casings for the bearing mechanism which are arranged at opposite ends of the hub and are adjustably connected by a barrel of peculiar construction.

Another object is to employ means for taking up end wear of the rollers independently of each other.

Other objects are to construct a bearing of few parts and to so connect or assemble the parts as to prevent them from becoming accidentally displaced and lost.

With these and other objects in view the invention consists in the novel construction and combination of parts hereinafter more fully described, and illustrated in the accompanying drawings, showing the preferred form of my invention, and in which—

Figure 1 is a longitudinal section through a hub employing my improved bearing. Fig. 2 is a section on line 2 2, Fig. 1. Fig. 3 is a section on line 3 3, Fig. 1. Fig. 4 is a section on line 4 4, Fig. 1. Fig. 5 is a section on line 5 5, Fig. 1. Fig. 6 is a side elevation of one set of rollers and their cage. Fig. 7 is a similar view of the cage with the rollers removed therefrom. Fig. 8 is a section on line 8 8, Fig. 7, showing one of the adjustable bearings in position. Fig. 9 is a side elevation of the barrel of the hub. Figs. 10 and 11 are views of opposite ends thereof. Fig. 12 is a section through one of the rollers of the bearing. Fig. 13 is an elevation of one of the outer bearings of the rollers. Fig. 14 is a similar view showing the adjusting-nut in section. Fig. 15 is an elevation of an inner bearing for a roller, showing the adjusting-nut in section and end view. Fig. 16 is a section through a modified form of roller. Fig. 17 is a view of an outer bearing therefor; and Fig. 18 is a section through said bearing, showing it in position upon one end of the cage.

Referring to the figures by numerals of reference, 1 is a wheel-hub having a bore 2 therethrough, the ends of which are countersunk to form pockets 3. Each pocket is adapted to receive a cup having its inner wall inclined and provided upon its outer surface with a rib or projection 4, adapted to engage the wall of the pocket and prevent the cup revolving. One of the cups 5 is provided at its inner end with a circular recess 6, adapted to receive the head 7 of a metallic barrel 8, extending through the hub. This head 7 has a recess 9 therein for the reception of a suitable turning-tool, and the opposite end of the barrel is threaded to engage the threaded aperture 10, formed in the inner end of the second cup 11 of the device.

The axle 12 extends through both cups and the barrel, and mounted thereon within each cup is a sleeve 13, having an annular groove 14, which serves as a race for the rollers of the bearing.

A revoluble cage 15 is mounted in each cup and extends around the sleeve 13 therein. Each cage is formed in a single casting comprising end rings 16 and longitudinally-extending connecting-strips 17. Threaded apertures 18 are formed in each ring between the strips 17 and are adapted to receive bearing-pins for the tapered rollers 19 of the bearing.

The rollers are preferably of the form shown in Figs. 1, 6, and 12, conical recesses 20 being formed in the center of the ends. The outer bearing-pins for these rollers comprise cylindrical bodies 21, each of which has one end tapered, as at 22, so as to bear within a recess 20. A threaded stem 23 extends from the opposite end of each body 21 and receives a nut 24, which is adapted to be screwed thereon as far as the body 21. This nut normally rests against the end of the body portion, and the stem 23 is adapted to be inserted into an aperture 18 in the outer ring of the cage. A lock-nut 25 is screwed upon the end of the stem 23 and serves to clamp the ring 16 against the inner nut 24. The recess 20 in the large end of one of the rollers 19 is placed over the tapered end of the bearing-pin, and the recess in the opposite end of said roller is then adapted to receive the tapered end 26 of its inner bearing-pin. This pin is threaded from one end down to the tapered portion and is preferably grooved, as at 27, for the reception of the edge of a screw-driver. The pin is screwed through an aperture in the inner ring of the cage and through a nut 28, placed upon the inner face of said ring. The thread upon the pin may then be crushed to prevent the removal thereof, or a suitable key 29, as shown in Fig. 6, may be employed.

The rollers are all placed in position within the cage, as above described, and as the sleeve 13 is placed in position in the cage before the rollers are mounted the sleeve, cage, and rollers can all be placed upon the axle at the same time.

As the inner bearing-pins 26 cannot be removed after once placed in position in the inner rings 16 and as the outer bearing-pins cannot be screwed outward, it will be seen that loss of the rollers and the bearing-pins is prevented. Moreover, as the rollers travel in the race 14 the sleeve 13 cannot be moved except with the cage 15.

End wear upon the rollers is taken up independently. Should one roller become loose upon its bearings, it is merely necessary to unscrew the lock-nut 25, turn the stem 23 inward, and then clamp the ring 16 between the nuts 24 and 25. It will of course be understood that, if desired, the inner bearing-pins 26 may be screwed inward and locked in order to take up wear upon the inner end of the roller.

When it is desired to take up wear upon the surfaces of the rollers or upon the inner faces of the cups 5 and 11, the axle 12 should be removed and the cages taken from the cups. The barrel 8 is revolved until disengaged from the cup 11, and said cups are then slid longitudinally from their respective pockets. A washer (not shown) is then placed at the inner end of each pocket and the parts reassembled.

In lieu of employing rollers and bearing-pins of the construction hereinbefore described I may, if desired, use rollers having tapered trunnions 30. These trunnions are adapted to bear in recesses 31, formed in heads 32 of pins. The pins of this construction will be mounted in the same manner as those heretofore described. The heads 32, however, permit the inner nuts 24 and 28 to be dispensed with.

It will be seen that the cups and barrel, as well as all other parts of the device, can be readily made.

As some of the rollers of the bearing will wear faster than others, it will be seen that my adjusting devices are superior to those which are adapted to adjust the rollers in unison. Moreover, by providing means for limiting the outward movement of the bearing-pins in the rings of the cage none of the bearings can become accidentally displaced. By providing an inclined inner surface to the wall of each cup and an inclined bottom to each race 14 I am enabled to employ tapered rollers having parallel axes.

In the foregoing description I have shown the preferred form of my invention; but I do not limit myself thereto, as I am aware that modifications may be made therein without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such changes as fairly fall within the scope of my invention.

Having thus fully described my invention, what I therefore claim as new, and desire to secure by Letters Patent, is—

1. A roller-bearing comprising antifriction-rollers, a revolving cage, bearing-pins adjustably secured in opposite ends of the cage and forming bearings for the rollers, and means for preventing the removal of said pins from engagement with said rollers.

2. A roller-bearing comprising antifriction-rollers, a revolving cage formed in a single piece, a sleeve inclosed by said cage and forming a race for the rollers, bearing-pins adjustably secured in opposite ends of the cage and forming bearings for the rollers, and means for preventing the removal of the pins from the cage, whereby said rollers are locked in position within the cage.

3. A roller-bearing comprising antifriction-rollers, a revolving cage, bearing-pins adjustably secured in opposite ends of the cage, and having tapered ends projecting into recesses in the ends of the rollers and forming bearings therefor, and means for locking said pins against removal from engagement with the rollers.

4. The combination with cups having inclined inner surfaces; of a barrel adjustably connected to said cups and a bearing in each cup, said bearing comprising a sleeve, a cage formed in one piece and revolubly mounted on the sleeve, antifriction-rollers bearing upon the sleeve and cup, bearing-pins adjustably secured in opposite ends of the cage and forming bearings for the rollers, and means for locking said pins against removal from engagement with the rollers.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM G. GRIFFIN

Witnesses:

HERBERT D. LAWSON,
EMMET E. GRIFFIN.

43

C. S. LOCKWOOD.

PROCESS OF MAKING SPIRALLY WOUND ROLLS.

APPLICATION FILED NOV. 28, 1914.

1,152,110. Patented Aug. 31, 1915.

Fig. 1.

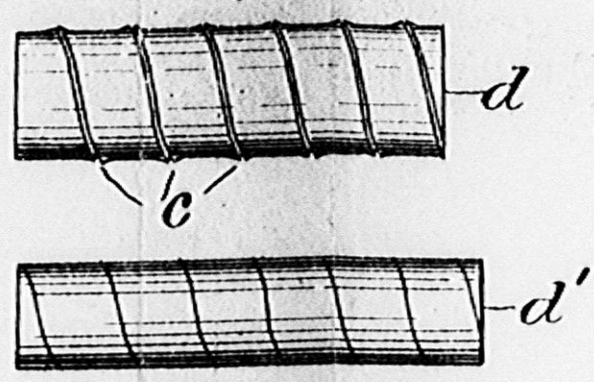


Fig. 3.

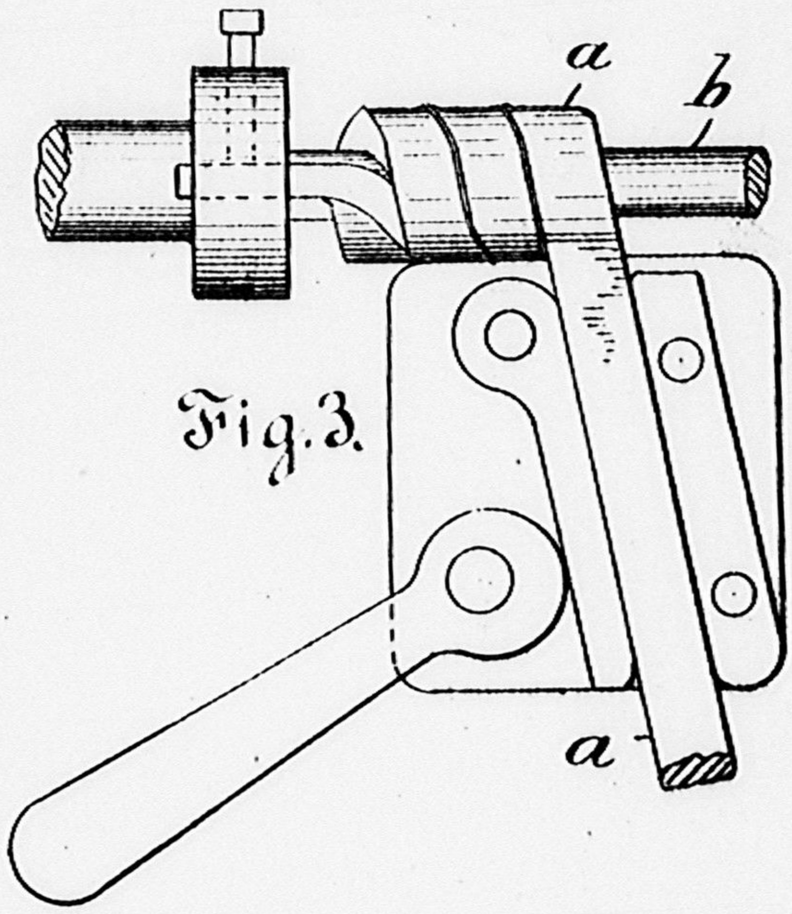


Fig. 2.

Fig. 4.

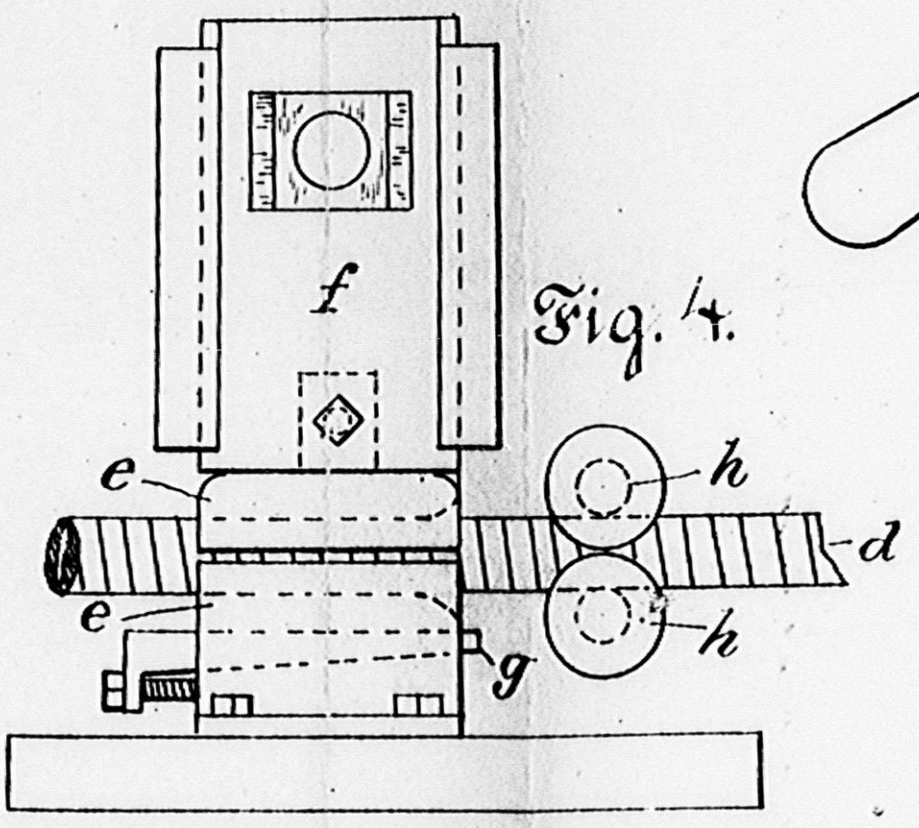


Fig. 5

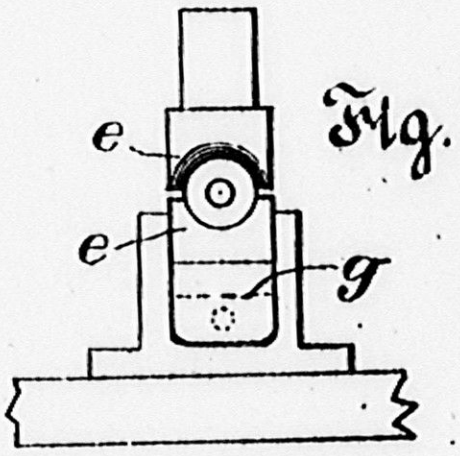


Fig. 9.

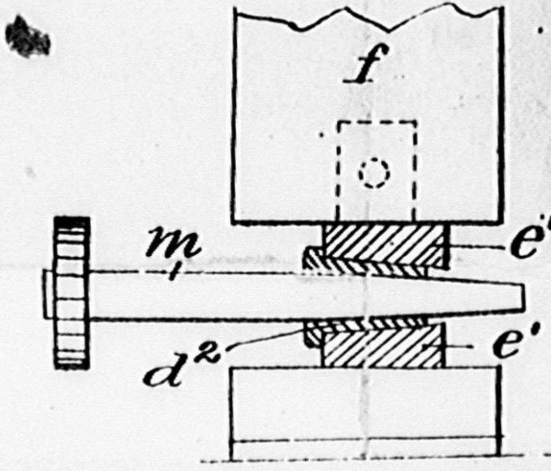


Fig. 8.

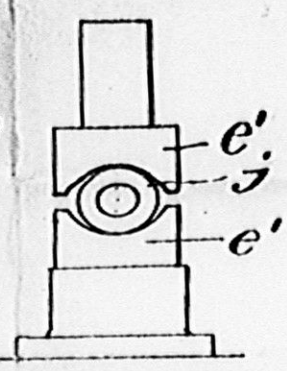


Fig. 6.

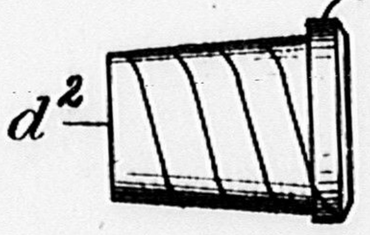
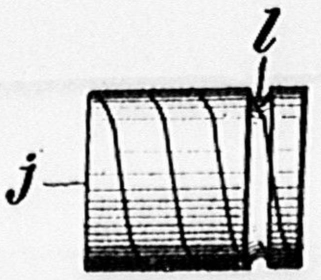


Fig. 7.



Witnesses:

S. Laynor.

J. Walter Greenbow

Inventor

Charles S. Lockwood, per

Thomas S. Crane, Atty.

UNITED STATES PATENT OFFICE.

CHARLES S. LOCKWOOD, OF NEWARK, NEW JERSEY, ASSIGNOR TO HYATT ROLLER BEARING COMPANY, OF HARRISON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PROCESS OF MAKING SPIRALLY-WOUND ROLLS.

1,152,110. Specification of Letters Patent. **Patented Aug. 31, 1915.**

Application filed November 28, 1914. Serial No. 874,403.

To all whom it may concern:

Be it known that I, CHARLES S. LOCKWOOD, a citizen of the United States, residing at 289 Market street, Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Processes of Making Spirally-Wound Rolls, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to an improved process for manufacturing a spirally wound roll with an integral collar upon one portion thereof, the process consisting primarily in first winding the strip into coils of substantially the diameter required for the collar, and second, swaging down the body of the roll to a suitable diameter, leaving the collar projecting beyond the said body.

In practice, a mandrel is fitted to the bore of the roll, which may be made cylindrical or tapering as desired, and the swaging dies may be shaped to swage down the body of the roll into tapering form for use in bearings where end-thrust is resisted.

To form an integral collar upon the roll, by the operation of swaging, thick coils are required, and when such coils are formed by winding a relatively thick strip upon a mandrel, the inner side of the strip is contracted and the outer side extended, causing the strip to assume a shallow trough-shaped cross section which causes ridges along the edges of the strip upon the outer side of the roll: but this defect in the surface of the roll is entirely compensated by the swaging of the roll-body to reduce its diameter, and by the final finishing of the same and the collar, by turning the surface in a turning lathe. Collared rolls may therefore be made by the present process, which have the elastic or spiral coils, and the desired accuracy of form and dimensions.

The invention will be understood by reference to the annexed drawing, in which—

Figure 1 is a side view of a roll with relatively thick convolutions having ridges along the edges thereof. Fig. 2 shows the same roll somewhat diminished in diameter and increased in length by swaging. Fig. 3 is a diagram illustrating the winding of a thick strip upon a small mandrel; Fig. 4 is a diagrammatic representation of a machine for swaging the rolls; Fig. 5 is an end view of the swaging dies; Fig. 6 is a side view of a tapering collared roll formed of spiral coils; Fig. 7 shows a cylindrical roll from which such collared roll may be formed; Fig. 8 shows, upon a smaller scale, dies for reducing the body of such collared roll; and Fig. 9 represents such collared roll in section upon a mandrel, with a section of the dies used for swaging it.

In Fig. 3, the strip a is shown wound upon a mandrel b so small as to greatly extend the exterior of the strip and give it a concave form, thus producing ridges c upon the roll d (shown in Fig. 1).

The rolls may be swaged by the swaging dies e shown in Fig. 4, which are shaped to press upon opposite sides of the roll when the upper die is reciprocated by the ram f. A wedge g is provided beneath the lower die to adjust the distance of the dies from one another with a uniform stroke of the ram f, and feed-rolls h are shown applied to the roll d to propel it through the dies for merely finishing the surface of the roll. The same mechanism without the feed-rolls is used to form the collared rolls shown in Fig. 6.

Where an annular projection i is desired upon the roll, as in the tapering roll d^2 shown in Fig. 6, a cylindrical roll j shown in Fig. 7, is first formed of the same diameter as the collar, and a neck or groove l is then formed adjacent to the location of the collar, and the remainder of the cylindrical roll j may then be swaged down, as indicated by the roll j and dies e' in Fig. 9, to form the body of the tapering roll.

Where a tapering body is desired, as shown in Figs. 6 and 8, the swaging operation is facilitated by inserting a tapering mandrel m in the roll, and compressing the body of the roll to fit the said mandrel by using the tapering dies e', shown in Fig. 9.

The dies, as shown in Fig. 9, are necessarily made with curvature larger than the tapering body, to first compress the rough body from which the tapering body is formed, and the roll, during the reduction to its final size, shown at d^2, may be subjected to several pairs of dies so as to secure a closer contact of the dies with the body of the roll, and this is especially desirable for exerting the final swaging action upon the metal, to give the body of the roll its final shape and finish.

The final shape given by the swaging operation may be sufficient to fit the rolls for use in some grade of bearings, but where they are to be used in a high-grade bearing, the rolls are turned in a lathe to give the body and collar nearly the desired size, then hardened, and finally ground to the desired dimensions.

Having thus set forth the nature of the invention what is claimed herein is:

1. The process of making a spirally wound roll with an integral collar, which consists in first winding the coils of the roll to substantially the diameter desired for the collar, and second, swaging down the body of the roll to a smaller diameter, leaving the collar projecting beyond the body.

2. The process of making a spirally wound roll with an integral collar, which consists in first winding the coils of the roll to substantially the diameter desired for the collar, second, necking the roll adjacent to the desired collar, third, fitting a mandrel to the bore of the roll, and finally swaging down the body of the roll upon such mandrel, leaving the collar projecting beyond the said body.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES S. LOCKWOOD.

Witnesses:
E. I. Williams,
M. E. Jahn.

G. L. MILLER.
ROLLER BEARING.
APPLICATION FILED AUG. 4, 1920.

1,392,019. Patented Sept. 27, 1921.

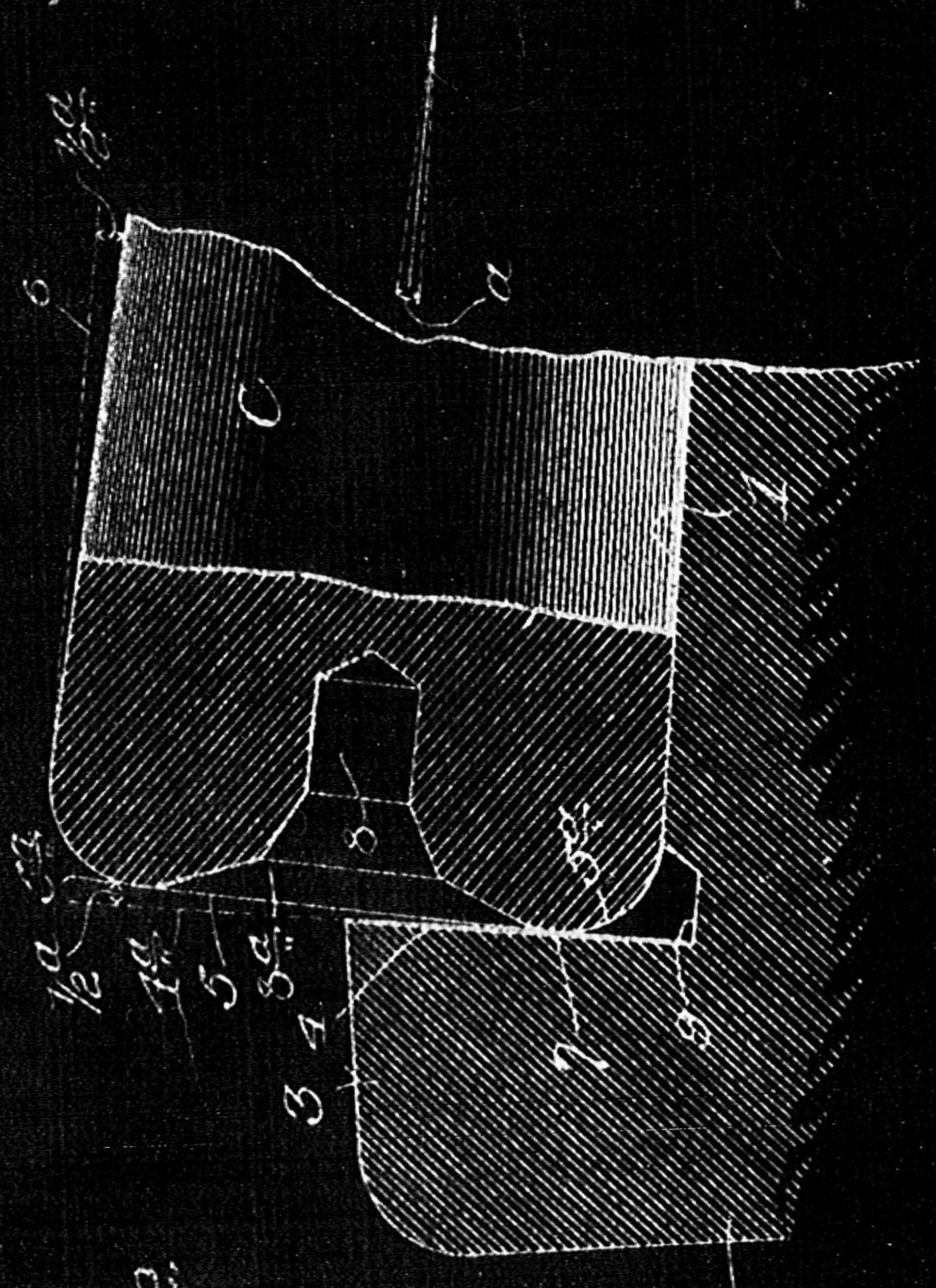


Fig. 2.

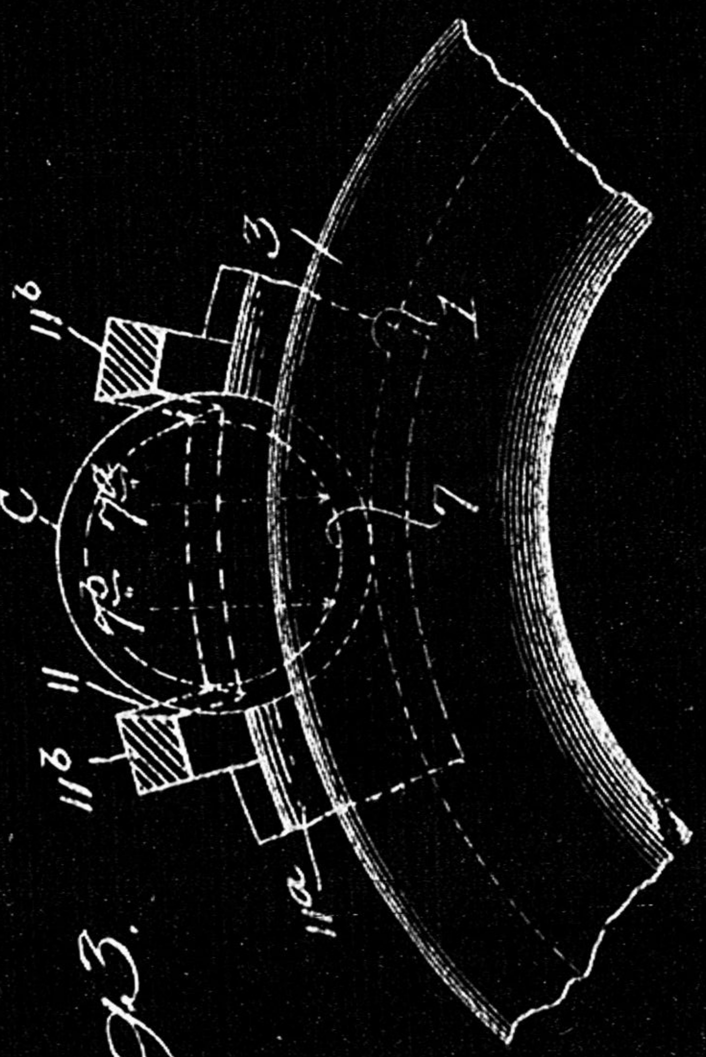


Fig. 3.

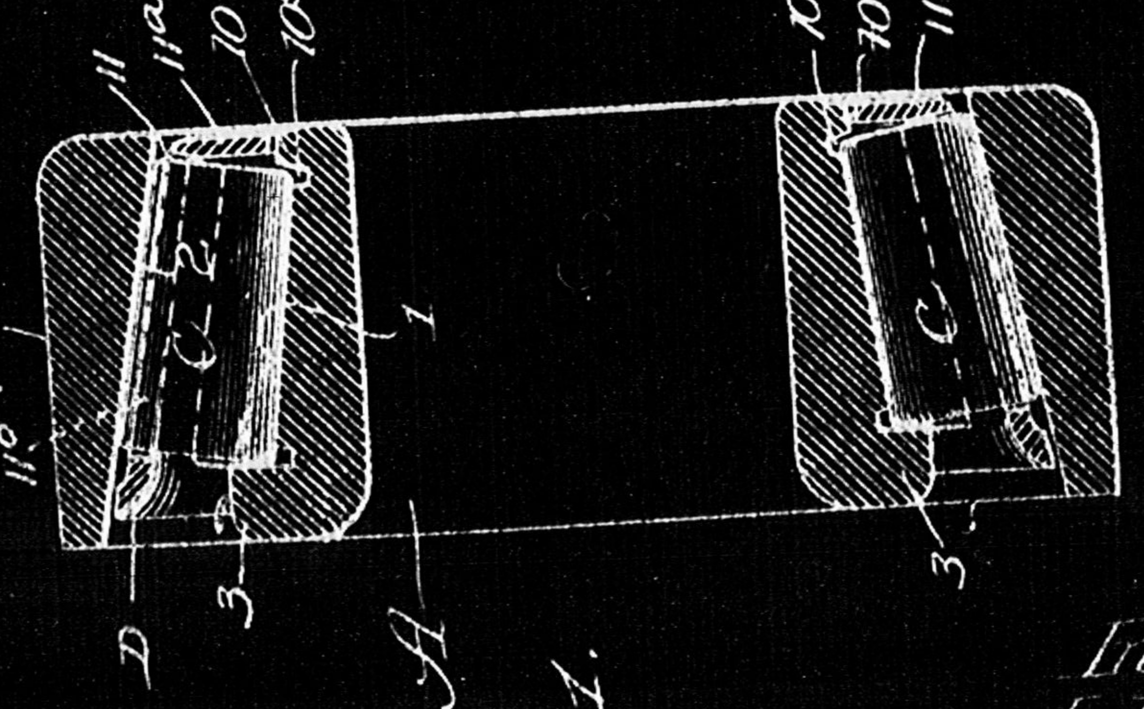


Fig. 1.

Inventor.
George L. Miller,
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

UNITED STATES PATENT OFFICE.

GEORGE L. MILLER, OF CANTON, OHIO, ASSIGNOR TO THE GILLIAM MANUFACTURING COMPANY, OF CANTON, OHIO, A CORPORATION OF OHIO.

ROLLER-BEARING.

1,392,019. Specification of Letters Patent. Patented Sept. 27, 1921.

Application filed August 4, 1920. Serial No. 401,216.

To all whom it may concern:

Be it known that I, GEORGE L. MILLER, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Improvement in Roller-Bearings, of which the following is a specification.

This invention relates particularly to taper roller-bearings; and the primary object of the invention is to provide for a true rolling-contact of the rollers with respect to both the radial thrust and the end thrust of the bearing.

The improved construction provides for maintaining a true line contact between each roller and the conical race surfaces and for maintaining a single-point rolling-contact between each roller and the thrust-flange with which the bearing is provided. Thus, the rollers are prevented from skewing or deviating from their true line contacts with the conical surfaces of the race-members, binding is avoided, and undue pressure upon the roller at any point is obviated. This is accomplished without sliding contact between the ends of the rollers and the thrust-flange. Hence, friction is reduced, and undue heating of the bearing is avoided. For these reasons, the improved bearings operate more efficiently, flaking off of the metal along the conical surfaces of the rollers and race-members is obviated, and sloughing off of the metal at the ends of the rollers is avoided. The result is that the bearing will run comparatively cool, thus increasing the efficiency and prolonging the life of the bearing. Comparative tests made with relation to roller-bearings now on the market and enjoying a wide-spread use indicate that the improved bearing will operate at a temperature of perhaps thirty to forty degrees less, under a heavy load, than the bearings referred to.

The invention is illustrated in its preferred embodiment, in the accompanying drawing, in which—

Figure 1 represents a sectional view of the improved bearing, a fragment of the roller-cage being illustrated; Fig. 2, a broken sectional view of the inner cone, or race-member, and one of the rollers, the view being on an enlarged scale; and Fig. 3, a broken end view showing the parts illustrated in Fig. 2.

It may be stated here that roller-cages are ordinarily employed for keeping the rollers properly spaced with relation to each other; and, in some constructions, the roller-cages are relied upon to prevent the rollers from skewing from their true line position. The present invention contemplates the use of a suitable cage for preserving the spaced relation of the rollers, but the spaces for the rollers should be sufficiently large to permit freedom of movement of the individual rollers, and the cage should not be depended upon to preserve the correct alinement of the rollers with relation to the race-surfaces.

It has been proposed heretofore to maintain the true line contact between the rollers and the conical race-surfaces by providing a two-point sliding-contact between the large ends of the rollers and the thrust-flange of the inner cone. Such a construction is subject, in large measure, to the objections which pertain to the use of the roller-cage itself for maintaining line contact between the rollers and the conical race-surfaces. That is, the sliding action which such a construction entails produces friction, causes undue heating of the bearing, and results in flaking or sloughing off the metal, which mixes with the lubricant, and thus the efficiency and life of the bearing are reduced.

In the construction illustrated in the accompanying drawing, A represents an inner cone, or race-member; B represents an outer cone or race-member; C, C represent the rollers; and D represents the roller-cage. The race-members A and B are provided with truncated conical surfaces 1 and 2, which, if extended, would meet at a common apex. That is, these conical race-surfaces converge toward a common point; and the rollers are taper rollers confined between these surfaces, and the included angle between the taper sides of each roller is the same as the angle between the converging race-surfaces of the bearing.

One of the cones, preferably the inner cone A, is provided at its large end with a thrust-flange 3 whose inner side presents a thrust-surface 4 which is substantially at right angle to the conical bearing-surface 1. The included angle of the roller C is indicated in the small diagram in connection with Fig. 2 and is designated *a*. The planes of the ends of the roller are normal to the axis of the roller. Thus, the plane of the large end of the roller is designated 5 in Fig. 2. The annular corners of the rollers are rounded, however, as indicated at 5^a. It follows that there is an angle equal to one-half the angle a between the taper-surface of the roller and a line 6 parallel to the axis of the roller, as indicated in Fig. 2; also, that there is an angle equal to one-half the angle a between the end plane 5 of the roller and the thrust-surface 4 of the inner cone. The extension of the thrust-surface 4 is indicated by the dotted line 4^a and the angle between the end plane of the roller and the thrust-surface of the flange is designated $\frac{1}{2}^a$. In practice, the angle a is quite small, ordinarily about three degrees. The thrust-surface 4 is tangential to the curve 5^a seen in longitudinal section. It follows that there is a single-point contact, as indicated at 7, between the large end of the roller and the thrust-flange. Following the line 5 which marks the plane of the end of the roller, and which also indicates the rolling-contact circle between the end of the roller and the thrust-flange, it will be understood that the end plane of the roller diverges from the thrust-surface above the contact-point 7, thus leaving a slight clearance only just above the contact-point. If, in operation, the roller should skew slightly from its true line contact with the cone, contact would be instantly established between the end of the roller and the thrust-surface at a point one side or the other and slightly above the contact-point 7. In Fig. 3, it is assumed, for illustration, that the newly established contact-point would be either at the point 7^a or the point 7^b, depending upon which way the roller skews from its true line-contact position.

Thus, if the roller skews slightly, the newly established contact-point immediately exerts a corrective influence and returns the roller to its true line-contact position. Normally, the end of the roller has a single-point rolling-contact with the thrust-flange, so that no sliding action occurs in the normal operation of the roller.

It is preferred to provide the large end of the roller with a central recess 8 adapted to receive lubricant. The curved surfaces 5^a are extended inwardly so as to provide the end of the roller with a concavity 8^a which communicates with the central recess 8. It follows that the lubricant introduced into the bearing can freely enter the recess 8 and pass to the contact-point 7. It is preferred, also, to provide an annular recess 9 at the junction between the conical surface 1 and the inner surface of the thrust-flange, so that the lubricant can collect there and work along the conical bearing surface of the inner cone.

While the tendency of the taper rollers, because of their wedge-like shape, is to work toward the thrust-flange 3, it is usual to provide an inner flange or shoulder to maintain the bearing in assembled condition. In Fig. 1, the flange 10 designates such a retaining shoulder formed integrally with the inner cone. In some cases, however, the retaining flange is in the form of a split ring, as illustrated, for example, in my Patent No. 1,282,450, granted October 22, 1918. It is preferred to provide, adjacent the flange 10, an annular recess 10^a, in which lubricant may collect.

It is usual to provide the thrust-flange on the inner cone or race-member, and this is the preferred form. If desired, for any reason, however, this may be reversed and the thrust-flange may be provided on the outer race-member or cup.

Referring to Fig. 2, it will be seen that the thrust-surface 4, in the preferred construction, is perpendicular to the conical race-surface 1. Such construction provides a sufficiently small clearance angle between the end plane of the roller and the thrust-surface of the flange to enable a corrective influence to be applied the instant a roller tends to skew from the true line-contact position. It will be seen, however, that the angle between the thrust-surface 4 and the conical-surface 1 may be reduced to slightly less than a right angle, and still permit some clearance. In fact, the angle may be reduced to a point approaching the elimination of the angle $\frac{1}{2}^a$. There should, however, always be a slight clearance angle between the end plane of the roller and the thrust-surface of the flange to insure a single-point rolling-contact between the end of the roller and the thrust-surface of the flange.

The beneficial results enumerated above are obtained by means of the improved construction. It may be stated, also, that where the angle between the conical surface 1 and the thrust-surface 4 is a right angle, the grinding of the surface of the inner race-member is facilitated. Thus, the conical surface 1 may be ground by the circumferential surface of the grinding-wheel; and, assuming the lateral surface of the grinding-wheel to be perpendicular to the axis of the grinding-wheel, the lateral surface of the grinding-wheel may be employed to grind the surface 4 normal to the surface 1. Thus, a single grinding operation will suffice to produce a true inner race-member.

The roller-cage D may be of any suitable construction. As shown, it comprises a conical shell provided with roller-receiving slots 11 and with an inturned flange 11^a at its small end. The slotted construction provides longitudinal members 11^b which separate the rollers. The slots 11 are large enough, however, to allow the self-righting action of the rollers to occur.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is—

1. A roller-bearing comprising inner and outer race-members having convergent taper race-surfaces, a series of interposed self-righting taper rollers provided at their large ends with rounded corners, and a thrust-flange carried by the large end of one of the race-members and having a thrust-surface disposed in a plane approximately parallel with the end plane of the rollers but with a slight clearance angle between said planes, each roller having a single-point contact with the thrust-surface of the flange in normal operation and said thrust-surface serving to engage the roller at points immediately flanking the normal contact point and thus return the rollers to true line-contact position when slight deviations occur, the successive contact points at the large end of the roller forming an annular line affording a plane normal to the axis of the roller.

2. A roller-bearing comprising an inner race-member having a taper race-surface and provided at its large end with a thrust-flange having a thrust surface approximately normal to the race-surface, an outer race-member, and interposed self-righting taper rollers having their large ends provided with rounded corners which terminate in an end surface lying in a plane normal to the roller-axis and adapted to make single-point contact with said thrust-surface, a slight clearance angle only being left between the end plane of the roller and said thrust-surface, whereby the thrust surface will, upon slight deviation of the roller from true line-contact with the race-surfaces, exert immediately a turning moment and restore the roller to true line-contact.

3. A roller-bearing comprising an inner race-member having a taper race-surface and provided at its large end with a thrust-flange having a thrust-surface perpendicular to the race-surface, an outer race-member, and interposed self-righting taper rollers having their large ends provided with rounded corners which make single-point contact with said thrust-surface, thus providing a slight clearance angle only between the end plane of the roller and the thrust-surface, the annular rounded corner of the large end of each roller merging in a plane normal to the axis of the roller, said thrust surface serving on slight deviation of the roller from true line-contact position to exert immediately a turning moment and restore the roller to true line contact position for the purpose set forth.

4. A roller-bearing comprising an inner race-member having a taper race-surface and provided at its large end with a thrust-flange having a thrust-surface approximately normal with relation to the race-surface, an outer race-member having a taper surface converging with respect to the taper surface of the inner race-member, and interposed taper rollers having their large ends provided with rounded corners which make single-point contact with said thrust-surface, a slight clearance angle only being left between the end of the roller and said thrust-surface, the large ends of the rollers having lubricant recesses adapted to conduct lubricant to the single-point contacts at the large ends of the rollers.

5. A roller-bearing comprising inner and outer race-members and a series of interposed self-righting taper rollers, which are out of contact with each other, one of said race-members having an end-thrust surface and each of said rollers having single-point thrust contact with said thrust-surface and presenting a circle of said contact points forming a thrust plane for the roller which is normal to the axis of the roller, the thrust plane of the roller forming a slight clearance angle only with respect to a radial line lying in the thrust surface of the race-member, the thrust surface of said flange serving, on slight deviation of the roller from true line-contact position, to exert immediately a turning moment and restore the roller to true line contact position, for the purpose set forth.

6. A roller-bearing comprising an annular race adapted to receive conical rollers, and self-righting conical rollers out of contact with each other in said race, said race being provided with an end thrust surface, and each of said rollers having a thrust surface in a plane normal to the axis of the roller and having single point contact with and forming a very slight clearance angle with said first-named surface, said surfaces being adapted to exert corrective re-action on the roller upon a slight deviation of the roller from its true line contact position in the race, whereby the roller is rendered self-righting.

7. A roller-bearing comprising an inner race-member having a taper race-surface and provided at its large end with a thrust-flange having a thrust surface approximately normal to the race-surface, an outer race-member, interposed self-righting taper rollers having their large ends provided with rounded corners which terminate in an end surface lying in a plane normal to the roller-axis and adapted to make single-point contact with said thrust-surface, a slight clearance angle only being left between the end plane of the roller and said thrust-surface, whereby the thrust-surface will, upon slight

deviation of the roller from true line-contact with the race-surfaces, exert immediately a turning moment and restore the roller to true line-contact, and a cage spacing said rollers, said cage having pockets receiving the rollers freely therein and permitting the self righting action of the rollers to occur.

8. A roller-bearing comprising an annular race adapted to receive conical rollers, self-righting conical rollers out of contact with each other in said race, said race being provided with an end thrust surface, and each of said rollers having a thrust surface in a plane normal to the axis of the roller and having single point contact with and forming a very slight clearance angle with said first-named surface, said surfaces being adapted to exert corrective reaction on the roller upon a slight deviation of the roller from its true line contact position in the race, whereby the roller is rendered self-righting, and a cage spacing said rollers, said cage having pockets receiving the rollers freely therein and permitting the self righting action of the rollers to occur.

GEORGE L. MILLER.

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W. F. HUTHER.

ROLLER BEARING.

APPLICATION FILED MAR. 5, 1920.

1,402,071. **Patented Jan. 3, 1922.**

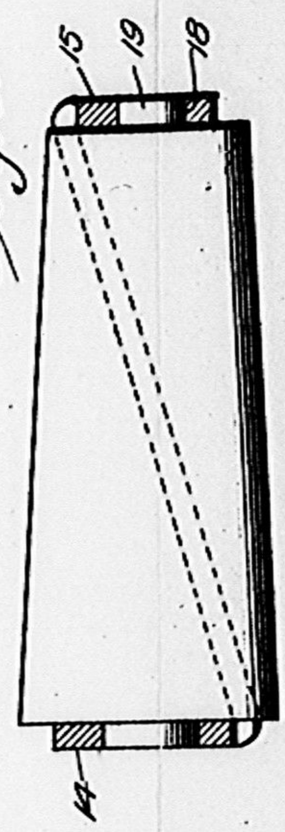
Fig.5.

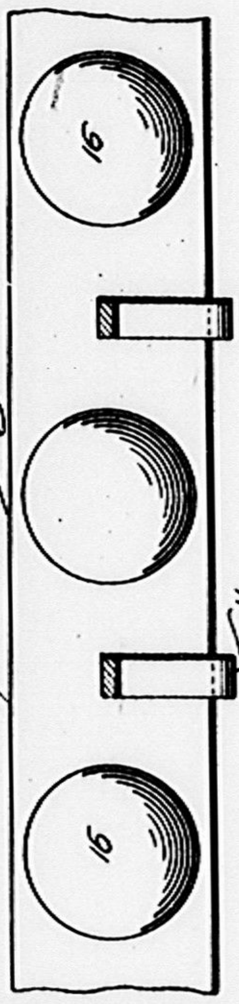
Fig.4.

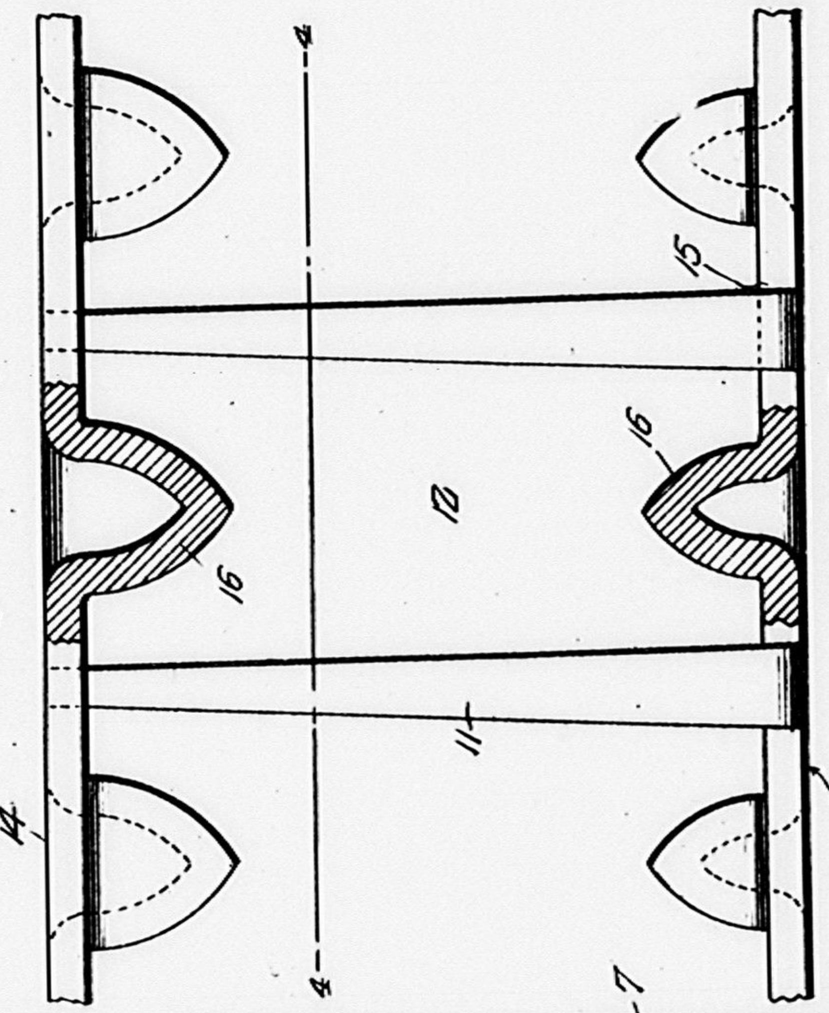
Fig.3.

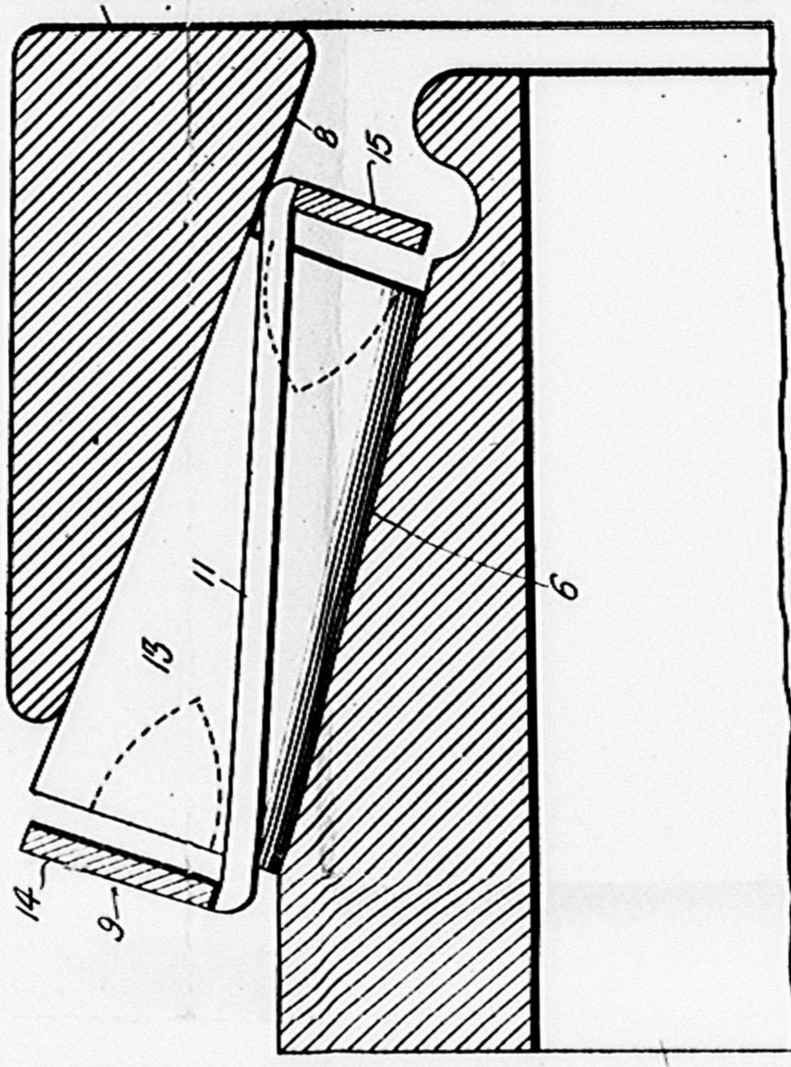
Fig.7.

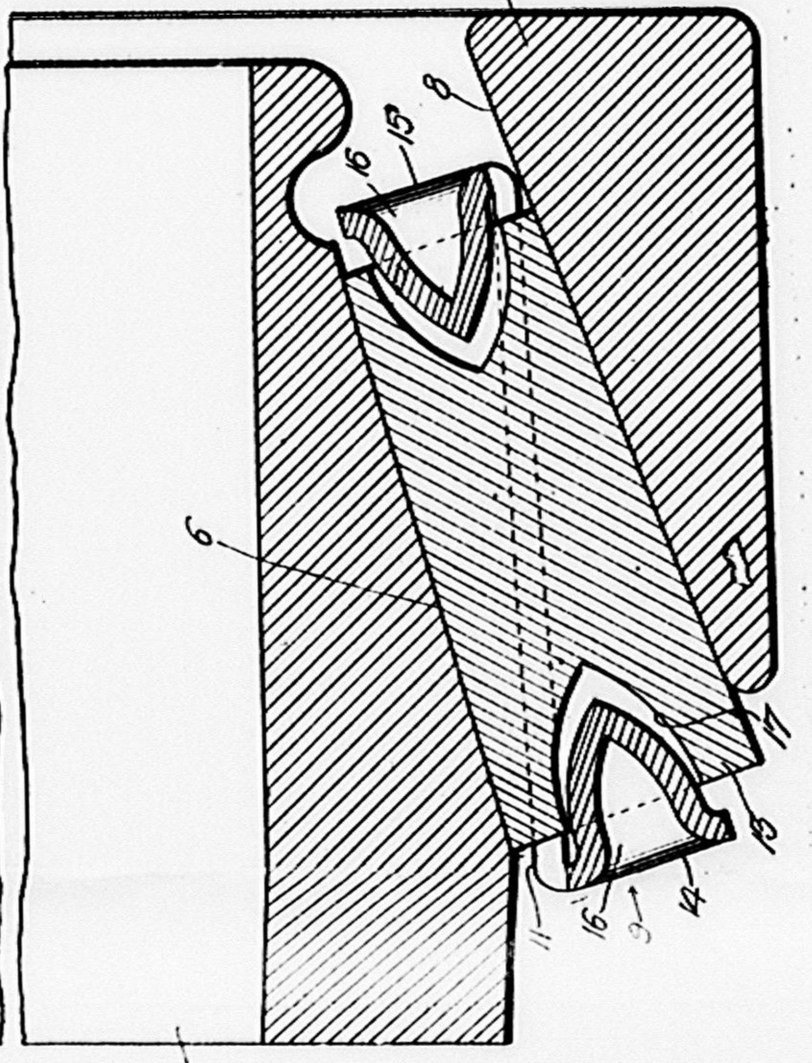
Fig.2.

WITNESSES

J.H.Crawford.

INVENTOR

Wm F. Huther

BY

A. B. Foster.

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM F. HUTHER, OF CANTON, OHIO.

ROLLER BEARING.

1,402,071. Specification of Letters Patent. **Patented Jan. 3, 1922.**

Application filed March 5, 1920. Serial No. 363,548.

To all whom it may concern:

Be it known that I, William F. Huther, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Roller Bearings, of which the following is a specification.

My invention relates to roller bearings.

An important object of the invention is to provide a cage included in the roller bearing, which cage is formed from a single section of sheet or plate metal, and adapted for receiving and holding the rollers or roller elements in the proper assembled condition, and preventing them from being displaced with respect to the longitudinal axis of the bearing, and also from crowding.

A further object of the invention is to provide a cage of the above mentioned character, which is simple in construction, cheap to manufacture, strong and durable.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same.

Figure 1 is a central longitudinal section through a roller bearing embodying my invention, parts being broken away,

Figure 2 is a similar view showing the roller in section,

Figure 3 is a plan view of the cage, parts broken away and parts in section,

Figure 4 is a longitudinal section taken on line 4—4 of Figure 3, and,

Figure 5 is a transverse section through a slightly different form of roller and cage embodying the invention, and corresponding with the position shown in Fig. 1.

In the drawings, wherein for the purpose of illustration are shown preferred embodiments of my invention, the numeral 5 designates an inner bearing member, preferably having an outer tapered surface 6. Surrounding this inner member is an outer bearing member 7, preferably having a tapered or conical inner surface 8, as shown. The surfaces 6 and 8 preferably form a tapered annular passage or space.

The numeral 9 designates my improved cage, as a whole, which may be formed of sheet or plate metal, such as steel. This cage may be a stamping and embodies an annular body portion 11, flat in cross section, and arranged diagonally of the tapered passage. The body portion 11 is provided with equi-distantly spaced openings 12, which are tapered, for receiving tapered rollers 13. It is obvious that any other form of rolling element may be employed. The rollers 13 are confined between the surfaces 6 and 8, to contact therewith.

Formed integral with the opposite edges of the body portion 11 are annular flanges 14 and 15, preferably bent from the material of the same. These flanges extend in opposite directions with relation to the diagonal body portion 11. The flanges 14 and 15 have pivot elements 16, which are preferably hollow and tapered, the same extending inwardly to the pivotally mounted within tapered recesses 17, formed in the ends of the rollers 13. The pivot elements 16 are in the form of trunnions, which are pressed or spun from the material of the flanges 14 and 15, which operation may be performed after the rollers 13 are assembled within the openings 12, if desired.

In Figure 5, the cage 9 has its flanges 14 and 15 provided with openings 18, instead of the trunnions 16. The rollers 13 are provided with trunnions 19, pivoted within the openings 18.

The tapered arrangement of the surfaces 6 and 8 and the tapered rollers 13, serves to take up the end thrust or load, as well as the radial thrust, and provides for an adjustment of the bearing, to take up all slack due to wear. The cage is preferably constructed of sheet steel having a suitable thickness whereby it is rigid.

It is to be understood that the forms of my invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

A roller bearing including an inner race member having a frusto-conical outer surface unobstructed at its larger end, an outer race member having an inner frusto-conical surface spaced away from the outer surface of the inner member to provide an annular passage tapering longitudinally in one di-

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rection, a roller cage located in said passage and having a substantially cylindrical body portion provided with spaced apertures, an inwardly extending frusto-conical flange integral with one end of said body portion, an outwardly extending frusto-conical flange integral with the opposite end of said body portion and arranged substantially parallel to the first mentioned flange, tapered rollers arranged in said passage between said flanges and decreasing in diameter toward the reduced end of the passage, said rollers having recessed ends, and trunnions integral with same flanges and extending into said recesses.

In testimony whereof I affix my signature.

WILLIAM F. HUTHER.

RÉPUBLIQUE FRANÇAISE.

OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION.

VIII. — Mines et métallurgie.

3. — Métaux ouvrés.

N° 491.251

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Procédé de perçage à chaud des lopins.

M. Louis RENAULT résidant en France (Seine).

Demandé le 14 octobre 1915, à 15^h 20^m, à Paris.

Délivré le 28 janvier 1919. — Publié le 28 mai 1919.

La présente invention a pour objet un procédé de perçage à chaud des lopins caractérisé en ce que le lopin est placé dans une matrice comportant deux cônes qui servent à centrer convenablement le lopin, avant que le poinçon ne soit enfoncé dans ce dernier, dans le but d'assurer un forage concentrique et un corroyage parfait du métal.

Les dessins annexés représentent, à titre d'exemple, une forme d'exécution d'un dispositif permettant de mettre en œuvre le procédé suivant l'invention.

La fig. 1 est une coupe verticale du dispositif montrant les positions relatives des outils avant le forage.

La fig. 2 montre la position occupée par le lopin au moment où va s'effectuer le forage.

La fig. 3 est une vue en coupe verticale du lopin percé.

La fig. 4 est une variante de construction.

Sur la fig. 1, *a* représente une matrice comportant deux cônes : un premier cône représenté en *b*, dont les génératrices sont faiblement inclinées, et un second cône *c* dont les génératrices sont plus inclinées et dont le diamètre inférieur devra toujours être plus petit que le diamètre du plus petit des lopins qui pourrait être passé ; ce deuxième cône sert à centrer le lopin ainsi qu'on le verra ci-après.

Une bague *e*, alésée intérieurement au diamètre du poinçon, comporte un cône e^1, dont le diamètre inférieur est plus grand que le diamètre du plus grand des lopins à faire passer ; cette bague est travaillée extérieurement en e^2 et vient coulisser dans un alésage a^1, de la matrice *a* qui lui sert de guide.

Le procédé, suivant l'invention, consiste à introduire le lopin *l* dans la matrice, à placer ensuite la bague *e* et à mettre ensuite une cale *f* sur cette dernière. On fait ensuite agir sur cette bague l'extrémité du poinçon *g* ; un premier effort est donné par l'intermédiaire de la cale *f* et de la bague *e* sur le lopin *l*, cet effort a pour résultat de centrer le lopin entre les surfaces coniques de la matrice *a* et de comprimer ensuite ce dernier de manière à lui faire remplir le pot de presse comme indiqué en fig. 2.

Lorsque le lopin est bien contenu dans le pot, on retire la cale *f* et on enfonce le poinçon *g* dans le lopin *l*, le poinçon passant à l'intérieur de la bague *e*, comme représenté en fig. 2. La fig. 3 représente le lopin percé.

Afin de centrer le poinçon *g* pendant la première phase de centrage du lopin et d'éviter tout glissement et faussage de ce poinçon, la plaque intermédiaire peut recevoir une forme incurvée et s'appliquer sur la bague guide *e* du poinçon portant à la partie supérieure un logement sphérique de même rayon, ainsi que l'indique la fig. 4 des dessins qui montre aussi quelques modifications dans la réalisation de l'appareil, notamment une matrice amovible *h* et l'adjonction d'un coussi-

Prix du fascicule : 1 franc.

net *i* servant de surface de glissement à la bague *c*.

Le procédé, d'après l'invention, présente l'avantage d'assurer, d'une part, le centrage absolu du lopin, ce dernier étant complètement bloqué dans la matrice et, d'autre part, de permettre un forage parfaitement concentrique par suite du guidage fourni par les surfaces coniques de la matrice et de la bague.

Ce procédé présente également l'avantage de percer en matrice fermée ce qui assure un corroyage parfait du métal.

RÉSUMÉ.

L'invention a pour objet un procédé de perçage à chaud des lopins, elle est caractérisée par les points suivant :

1° Le lopin est introduit entre une matrice comportant un cône vers sa partie inférieure et une bague guidée dans un alésage de la matrice pourvue, elle aussi, d'un cône analogue, et sur laquelle on fait agir avant le forage, par l'intermédiaire d'une cale, le poinçon de manière à lui faire remplir le pot de presse.

2° Le forage n'a lieu que si le lopin est bloqué dans la matrice, de manière à assurer un corroyage parfait du métal.

Louis RENAULT.

Par procuration :

Hippolyte Josse.

N° 491.251 **M. Renault** Pl. unique

Fig. 1

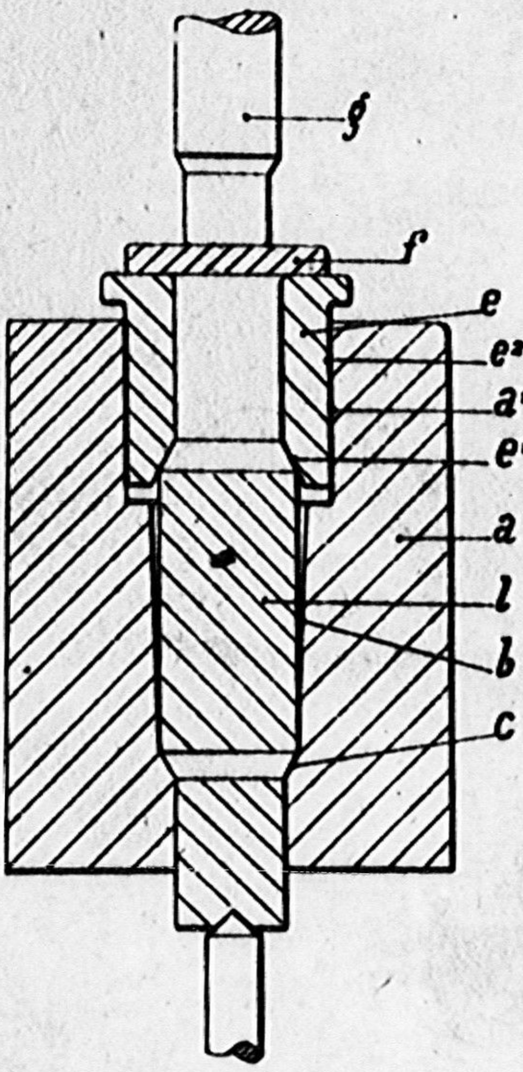


Fig. 2

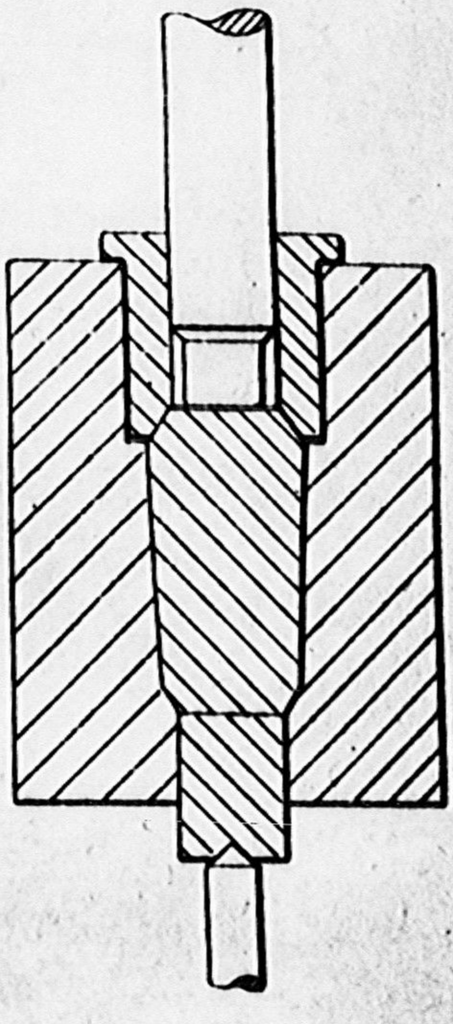


Fig. 4

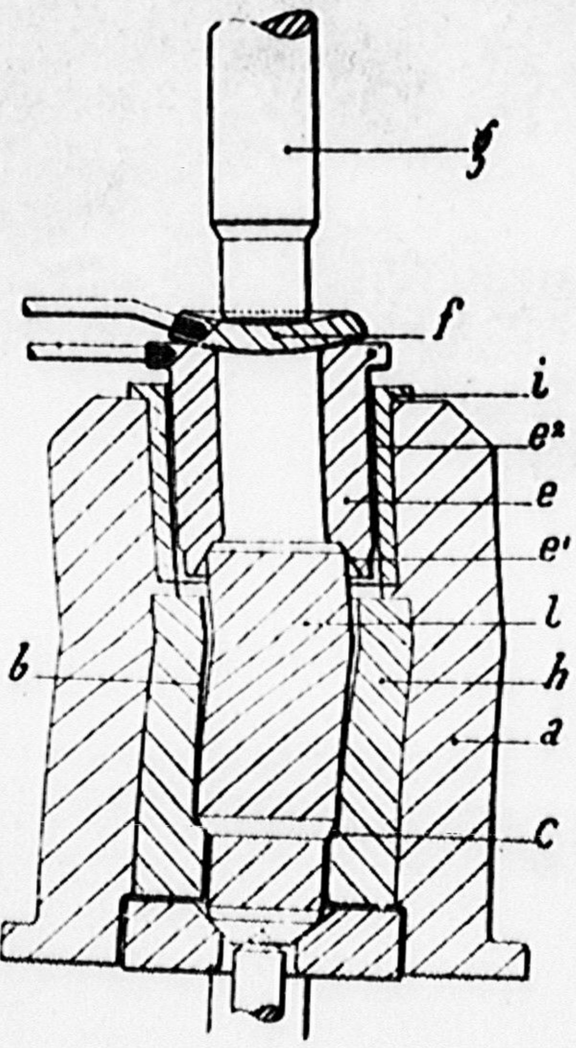
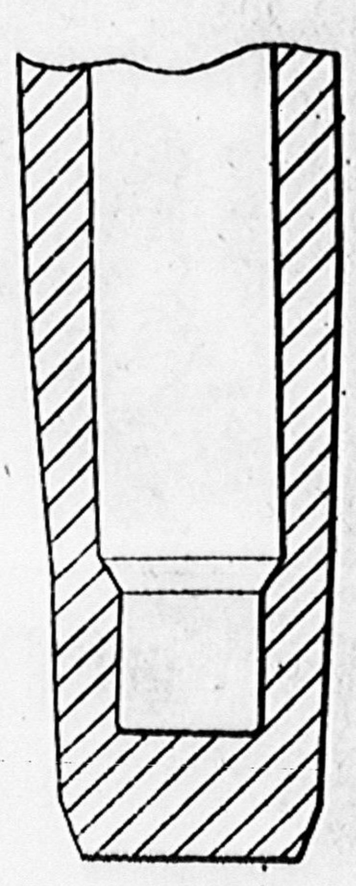


Fig. 3



101 2—390.

Department of the Interior, United States Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a Translation, made by the Official Translator from the Records of this Office, of the Specification, in the matter of the French Letters Patent to Renault. Dated October 14, 1915. Number 491-251, for Improvement in Process for Piercing Billets (Slab, Bloom) while Hot.

Attached, hereto, is a copy of the Drawing in the matter of the same.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this 18th day of May, in the year of our Lord, one thousand nine hundred and twenty-three and of the Independence of the United States of America the one hundred and forty-eighth.

[Seal Patent Office, United States of America.]

WM. A. KINNAN,
Acting Commissioner of Patents.

102 *Translation of French Patent* #491,251.

To L. Renault.

Process for Piercing Billets (Slab, Bloom) While Hot.

(Appl'n Oct. 14, 1915. Iss'd Jan. 28, 1919. Publ'd May 28, 1919.

The present invention refers to a process for piercing billets while hot characterized by placing the billet in a matrix comprising two cones which serve to center the billet suitably before the punch is driven into it, for the purpose of securing a concentric bore and a perfect finish of the metal.

The annexed drawings represent, by way of example, an embodiment of an apparatus permitting to put into practic

the process according to the invention, Fig. 1 is a vertical section of the apparatus showing the relative positions of the tools before boring. Fig. 2 shows the position occupied by the billet as it is going to be pierced. Fig. 3 is a vertical sectional view of the pierced billet. Fig. 4 is a modification.

In Fig. 1, *a* represents a matrix comprising two cones, the first represented at b, the generators of which have a slight inclination, the second cone at c, whose generators are at a greater inclination and whose lower diameter must always be smaller than that of the smallest billet that could be passed through. This second cone serves to center the billet, as will be seen later. A ring (guide-bushing) e, internally bored to the diameter of the punch, has a cone e′ the lower diameter of which exceeds that of the largest billet to be passed through. This bushing is externally machined at e^2 and slides within a bore a′ of matrix *a*, in which it is guided.

The process, according to the invention, consists in placing the billet 1 in the matrix, then putting the bushing e in place and putting the press-plate f on the latter. The end of the punch g is then brought to bear on the ring. A first stress is thus exercised by means of the wedge (press-plate) f and the ring e on the billet 1. The effect of this stress is the centering of the billet between the conic surfaces in matrix *a* and then to compress it,
103 & 104 causing it to fill the pressing-mold as indicated
in Fig 2.

When the billet is well held in this mold, the wedge f is withdrawn and the punch g is driven down into the billet 1, passing within the ring e, as represented in fig. 2. Fig. 3 shows the pierced billet.

In order to center the punch g during the first step, when the billet is being centered, and to avoid all sliding and bending of this punch, the interposed plate may be given a curved shape and be applied on the guide-bushing e for the punch, provided at its top surface with a spherical recess of the same diameter (as that of the punch,) as indicated in fig. 4. This figure also shows some modifications in the design of the apparatus, especially, a detachable matrix h and the addition of a bushing i serving as a gliding-urface to the ring e.

PATENT № 47365.

BESKRIVNING

OFFENTLIGGJORD AV

KUNGL. PATENT- OCH REGISTRERINGSVERKET.

AKTIEBOLAGET SVENSKA KULLAGERFABRIKEN,

GÖTEBORG

Sätt för pressning av rullar för rullager.

(Uppfinnare: N. A. Palmgren).

Klass: 49 g.

Patent i Sverige från den 12 april 1919.

Vid de hittills kända förfarandena för pressning av koniska rullar till rullager, har man i allmänhet förfarit så, att rullämnet anbragts i en mot rullens form svarande urtagning i en fast formdyna, varefter en rörlig stans med stor hastighet och kraft nedförts mot detsamma. Den rörliga stansen är därvid även försedd med en urtagning, i vilken rullämnets övre del intränger vid pressningen. Vid denna anordning utdrives det överskjutande materialet mellan kontaktytorna av de båda verktygen i form av en ringformig krans eller fläns å rullämnets mantelyta. Undersöker man närmare strukturen av ett på detta sätt behandlat rullämne, skall man finna, att materialet i detsamma undergått vissa på hållfastheten menligt inverkande förändringar, i det att fiberstrukturen deformerats vid den ringformiga kransen eller flänsen på sådant sätt, att fibrerna, som i det ursprungliga rullämnet ligga i ämnets längdriktning, här blivit lagda i veck eller avbrutits. Vid rullämnenas vidare behandling avsvarvas eller avslipas den ringformiga flänsen, varvid fiberstrukturen vid densamma ytterligare skadas. Då dylika rullar utsättas för belastning i ett lager, blir det ställe å rullarna, där fiberstrukturen deformerats *och skadats vid rullarnas framställning,* utsatt för ett väsentligt tryck. Olägenheterna rmed ligga i öppen dager och visa sig bland nat därigenom, att rullarna hava stor begenhet att skalas å de ställen, där valsfibrerna skurits.

Ändamålet med föreliggande uppfinning är att undanröjja denna olägenhet genom en framställningsmetod, som undviker bildandet av en dylik utstående ringformig fläns eller krans å löpytan. Uppfinningen kännetecknas huvudsakligen därav, att det i en formdyna helt nedsänkta rullämnet tillstukas uppifrån medelst en dorn, vars nedre arbetsyta är mindre än det färdigpressade rullämnets övre ändyta, så att det överskjutande materialet vid pressningen mellan de båda verktygen tränges ut i form av en rullämnets ändyta omgivande krans eller fläns. Härigenom bliva fibrerna i materialet deformerade endast å rullämnets övre yta, och således rullens hela löpyta fullständigt oskadad.

Å bifogade ritning är fig. 1 en vertikalskärning genom en del av ett verktyg för framställning av koniska rullar enligt en känd metod, under det att fig. 2 är en vertikalskärning genom en del av ett verktyg enligt föreliggande uppfinning.

Vid det i fig. 1 visade verktyget betecknar 1 den övre stansen och 2 formdynan, vilka vardera äro försedda med urtagningar 3 och 4 resp., vari rullämnet 5 inpressats. Såsom framgår av figuren, har av det överskjutande materialet vid pressningen bildats en ringformig krans eller fläns 6, som skjuter in mellan stansen 1 och formdynan 2. Samtidigt har materialet i rullämnet deformerats, i det att dess fiberstruktur, som åskådliggöres genom de inritade linjerna 7, veckats i höjd med flänsen 6.

Vid den i fig. 2 visade utföringsformen av ett verktyg enligt föreliggande uppfinning däremot är den i formdynan 2 anordnade urtagningen 4 av sådant djup, att rullämnet 5 fullständigt kan nedföras däri. Stansen 1 är försedd med ett centralt utsprång 10, vars nedre begränsningsyta 11 är mindre än det färdigpressade rullämnets övre ändyta. Då stansen 1 nedföres mot rullämnet, bringas detta att antaga samma form som urtagningen 4 i formdynan, under det att det överflödiga materialet pressas in i mellanrummet mellan urtagningens 4 vägg och utsprånget 10, så att det bildar en i rullgeneratrisens förlängning förlöpande fläns eller krans 6 runt omkretsen av rullens ändyta. Denna fläns 6 avfasas därefter, lämpligen efter en konisk yta 9, varvid nämnda yta erhåller en av deformeringen oberörd materialstruktur, såsom framgår av de i figuren visade strukturlinjernas 7 förlopp. Efter pressningen utstötes rullämnet på känt sätt ur urtagningen 4 med tillhjälp av en i urtagningens botten anordnad kolv eller dylikt 12. Djupet av urtagningen 4 bör lämpligen göras så stort, att flänsen 6 å det färdigpressade rullämnet icke sträcker sig upp över formdynans 2 övre begränsningsyta.

Patentanspråk:

Sätt att framställa rullar för rullager med en fiberstruktur, som i hela mantelytan ligger väsentligen i rullgeneratrisens riktning, kännetecknat därav, att ett rullämne med en fiberstruktur, vars riktning väsentligen sammanfaller med riktningen av generatrisen till ämnets mantelyta, utsättes för pressning i ämnets axelriktning i en ämnet helt upptagande formdyna medelst en i förhållande till formdynan så avpassad dorn eller stans, att det överskjutande materialet kan flyta ut i form av en rullämnets för pressningen utsatta ändyta omgivande krans eller fläns, utan att fiberstrukturen i rullämnets mantelyta väsentligt deformeras, varpå nämnda krans eller fläns avlägsnas.

(Härtill en ritning.)

Stockholm 1920. P. A. Norstedt & Söner.

Offentliggjord den 14 juli 1920.

200135

Till Patentet N:o 47365.

Fig. 1

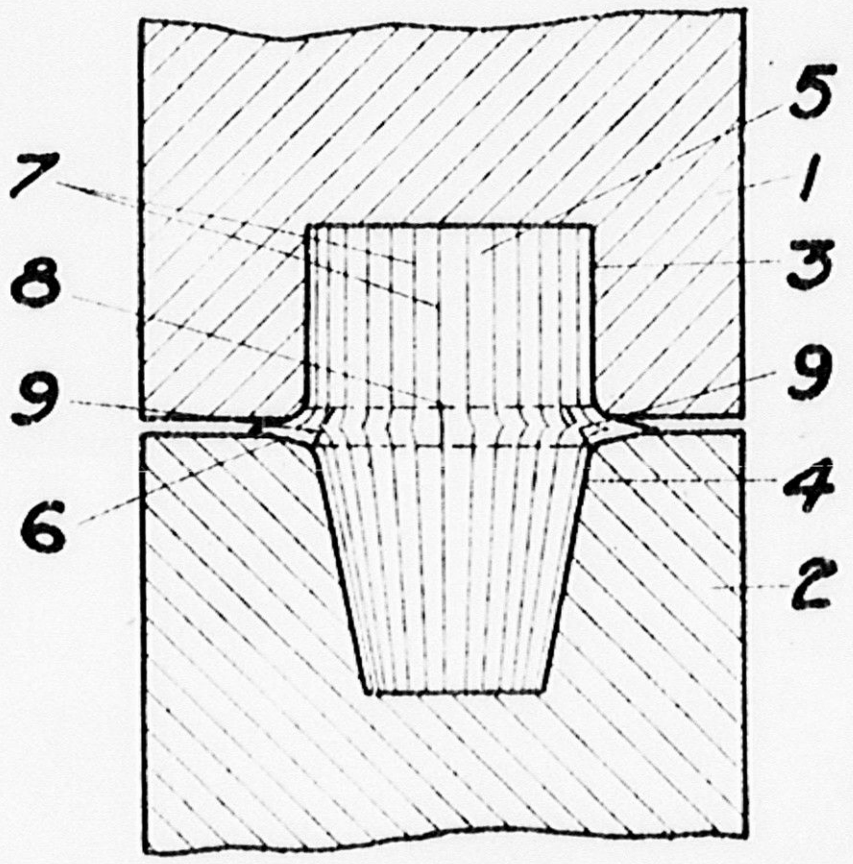
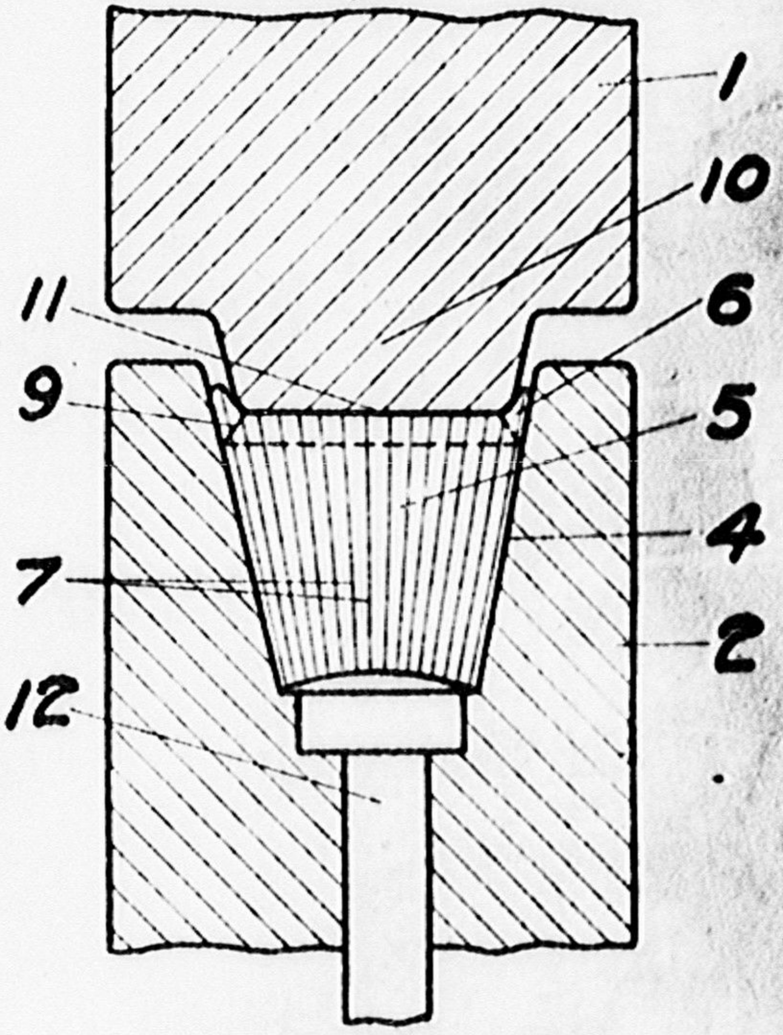


Fig. 2



Generalstabens Litografiska Anstalt.

The process according to the invention offers the advantage of securing, on the one hand, perfect centering of the billet, which is completely immovable within the matrix, and on the other, of permitting absolutely concentric boring through the guidance furnished by the conic surfaces of the matrix and ring. It offers the further advantage that the piercing takes place in a closed matrix, thereby ensuring perfect finish of the metal.

Summary. The invention refers to a process for piercing billets while hot. It is characterized by the following features.

1) The billet is put in between a matrix provided with a cone near its bottom, and a ring guided in a bore of the matrix and also provided with a similar cone on which, before the piercing operation, the punch is caused to act (a wedge being interposed) so as to cause the billet to fill its mold.

2) Piercing only takes place after the billet is held tight in the matrix, thus ensuring a perfect finish of the metal.

Fr-E/tr:PW. May 17, 1923. 9367.

(Here follows Swedish patent No. 47,365, pages 105, 106, and 107.)

108 *Translation of Swedish Patent No.* 47365.

Class 49g.

To Aktiebolaget Svenska Kullagerfabriket, Goteborg.

Patented in Sweden from April 12, 1919.

Published July 14, 1920.

Method of Pressing Rollers for Roller Bearings.

In the processes hitherto known for pressing conical rollers for roller bearings, the roller blank has generally been placed in a recess in a fixed molding matrix, corresponding to the shape of the roller, and a movable stamp with great speed and force applied to the same. The movable stamp is also provided with a recess, in which the upper part of the roller blank penetrates during pressing. With this device the protruding material is driven between the contact surfaces of the two tools in the form of a ring-shaped rim or flange on the mantle surface of the roller blank. If the surface of the roller blank treated in this way is more closely examined, it will be found that the material in the same has undergone certain changes detrimental to its durability, in that the fiber structure has been deformed at the rim or flange in such a way that the fibres, which in the original roller blank lie in its longitudinal direction, have been placed in folds or broken off. During the further treatment of the blank the flange is turned or ground off, and the fiber structure in the same is still more damaged. As such rollers are subjected to load in a bearing, the place where the fiber structure has been deformed and damaged in making the roller is exposed to considerable pressure. The inconveniences connected herewith are self-evident and are manifested, among other ways, therein, that the rollers have a great tendency to peel at the places, where the fibers have been cut off.

The purpose of the present invention is to eliminate this inconvenience by a method of manufacture, which avoids the formation of such a ring-shaped rim or flange on the running surface. The invention is characterized mainly thereby, that the roller blank, completely lowered into the
molding matrix, is compressed from above by a
109 mandrel, whose lower working surface is smaller
than the upper end surface of the ready-pressed
roller blank, so that the protruding material in pressing between the two tools is forced out in the form of a rim or flange encircling the end surface of the roller blank. In this way the fibers in the material are deformed only at the upper surface of the blank, and the entire running surface is thus completely undamaged.

On the appended drawing Fig. 1 is a vertical section through a part of a tool for making conical rollers according to a known method, while Fig. 2 is a vertical section through a part of a tool according to the present invention.

In the tool shown in Fig. 1, 1 designates the upper stamp and 2 the molding matrix, each of which is provided with recesses, 3 and 4 respectively, into which the roller blank 5 is pressed. As appears from the figure, a ring-shaped rim or flange has been formed in pressing from the protruding material, which pushes in between the stamp 1 and the molding matrix 2. At the same time the material in the roller blank has been deformed, in that its fiber structure, shown by the penciled lines 7, has been folded at the height of the flange 6.

In the form of construction shown in Fig. 2 of a tool according to the present invention the recess 4 made in the molding matrix 2 is, on the contrary, of such depth that the roller blank 5 can be completely lowered therein. The stamp 1 is provided with a central projection 10, whose lower bounding surface 11 is less than the upper end surface of the ready-pressed roller blank. When the stamp 1 is lowered against the blank, the latter is made to take the same form as the recess in the molding matrix, while the superfluous material is pressed in between the wall of the recess 4 and the projection 10, so that it forms a flange or rim 6 running in the prolongation of the roller generatrix around the end surface of the roller. This flange 6 is thereafter faced off following a conical surface 9, which receives a material structure unaffected by the deformation, as appears from the course of the structure lines 7 shown in the figure. After pressing the roller blank is ejected in known manner from the recess 4 by means of a piston or the like 12 arranged in its bottom. The depth of the recess should suitably be so great that the flange 6 on the ready-pressed roller blank does not extend above the upper bounding surface of the molding matrix 2.

Patent Claim.

Method of making rollers for roller bearings with a fiber structure which in the whole mantel surface lies essentially in the direction of the roller generatrix, characterized thereby, that a roller blank with a fiber structure whose direction essentially coincides with the direction of the generatrix of the mantle surface of the blank, is subjected to pressing in the axial direction of the blank in a molding matrix completely containing the blank by means of a mandrel or stamp so fitted with respect to the matrix that the protruding material can run out in the form of a rim or flange enclosing the end surface of the blank subjected to pressing, without the fiber structure in the mantel surface of the roller blank becoming to any degree deformed, whereafter the said rim or flange is removed.

Tr/GWH. 7/18/30.

111 Mailed Jul. 2, 1927.

Department of Commerce, United States Patent Office,
Washington, D. C.

Paper No. 26.

K/EO.

Before the Board of Appeals.

July 2, 1927.

In re application of Marcus T. Lothrop. Serial No. 488,-260. Filed July 28, 1921. Process of Making Conical Rollers.

Attorneys:
Messrs. Carr & Carr, Boatmen's Bank Bldg., St. Louis, Mo.

Examiner's Statement.

This is an appeal from the rejection of all the claims. The rejected claims are:

1. The improvement in the art of making conical rollers which consists in progressively coining a slug in a series of dies of which the last is of the size and taper desired for the roller.

2. The process of making conical rollers which consists in coining a slug of substantially the same volume as the finished roller in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and carburizing and hardening said green roller.

3. The process of making conical rollers which consists in coining a slug in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and with centering depressions in its op-

posite ends concentric with the axis thereof, carburizing and hardening said roller, mounting it on centering spindles entered into the end depressions thereof and grinding the surface thereof while thus centered.

4. The process of making conical rollers which consists
in coining in a conical die or dies a slug of
112 substantially the same volume as the finished roller to form
a green roller of approximately the size and shape desired for the finished roller and with its ends adapted to cooperate in centering said roller in a grinding machine, carburizing and hardening said roller, centering it in a grinding machine and grinding the surface thereof while thus centered.

6. The improvement in the art of making headless conical rollers which consists in placing a slug of the volume required for the roller inside a conical die whose bore is of simple conical form and upsetting the slug against the wall of said conical bore of said die, the plunger and knockout members that cooperate with said die each having a conical projection adapted to form an axial conical recess in an end of the roller.

7. The process of making conical rollers for roller bearings which comprises shortening and thickening a cylindrical slug of substantially the same volume as the finished roller by pressure against the ends thereof while in a conical die of the size and taper of such roller.

8. The process of making conical rollers for roller bearings which comprises the coining of a cylindrical slug of substantially the same volume as the finished roller into a blank whose side surface has substantially the same taper throughout the greater portion of its length as the finished roller, inserting the greater portion of said blank into a conical coining die whose side wall is of the same length, diameter and taper as the side surface of such finished article, and pressing said blank endwise to shorten it and spread it sidewise against the side wall of said conical die throughout the full depth of said side wall.

9. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one member has a conical bore of such length that the larger end of the upset slug projects slightly there-

from, and the second member has a radiused shallow recess of the same diameter as the large end of said conical bore.

10. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one member has a conical bore of greater diameter than the slug and of such length that the larger end of the upset slug projects endwise slightly therefrom, and the second member has a radiused shallow recess of the same diameter as the large end of said bore and
113 of the same volume as said projecting portion.

11. The process of making conical rollers for roller bearings which consists in upsetting a cylindical slug of steel of the same volume as the roller to be produced in a die member with a conical bore of such length that the larger end of the upset slug projects endwise slightly therefrom, such upsetting being effected by means of a plunger with a shallow radiused recess of the same diameter as the large end of said conical bore.

12. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one set comprises a member with a bore whose bottom edge is radiused and which is conical from said edge throughout the greater portion of its length, said bore being of greater diameter than the slug throughout the greater portion of its length and of such length that the larger end of the upset slug projects slightly therefrom, and a second member with a cylindrical bore with a flaring edge in which works a cylindrical plunger whose forward stroke carries its front edge flush with the end of the cylindrical portion of said bore, and a second set of which one member has a bore which is continuously conical from the larger end thereof to the radiused bottom edge thereof, said bore being of the same taper as the product, and a second member with a dished recess of the same diameter as the larger end of said conical bore.

13. The improvement in the art of making conical rollers which consists in forging a slug in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller, and with centering

depressions in its opposite ends concentric with the axis thereof, mounting it on centering spindles entered into the end depressions thereof and finishing the surface thereof while thus centered.

The references are:

Renault (French), 491,251, May 28, 1919.
Holden, 632,462, Sept. 5, 1899.
Wellman, 422,557, Mar. 4, 1890.
Lockwood, 1,152,110, Aug. 31, 1915.

The application relates to a process of making conical rollers for roller bearings. The process consists in forging a substantially cylindrical slug 6 in a tapered die or dies to produce a green or unfinished roller of the size and taper desired, with depressions in the ends suitable
114 for centering it in a grinding machine. The volume of the slug is approximately equal to the volume of the finished roller, a slight allowance being made for grinding. The slug 6 is placed in the cylindrical bore of the lower die 9 (See Fig. 2) and is swaged in the partly cylindrical and partly tapered bore of the vertically movable upper die 10 by pressure exerted by the plunger 11 of the lower die, whereby the slug is shortened endwise and spread laterally to conform to the surface of the upper die, (see Fig. 3) and is converted into a blank 12. At the same time a central depression 13 is formed in the lower end of the blank by an accurately centered projection 14 on the face of the plunger 11.

This blank is then subjected to pressure in another die 19 (see Fig. 4) by means of a plunger die 15 and the knock-out piece 20, having a projection 21 adapted to form a centering depression 22 on the upper end of the roller. The taper of the bores of die 15 is the same as desired for the finished product, so that the roller is forged to the desired shape. The roller is then carburized and hardened, when it is ready for grinding.

Applicant describes the swaging or forging operation as "upsetting".

The claims refer to this operation variously as "upsetting", "forging", "coining", and "shortening and thickening", the slug.

The French patent shows in Figs. 1 and 2 a die *a* having a bore tapered at *b* and *c*, the latter having a diameter

less than the cylindrical blank *l*. The upper die *e* has a bore of the same diameter as the punch *g* tapered at the bottom as indicated at *e'*, to a diameter greater than the
diameter of the blank *l*. The upper die is movable
115 in the bore *a'* of the die *a*.

In Fig. 1 the punch *g* is prevented from entering the die by the plate or obstruction *f*, and on the application of force the upper die *e* is moved downward causing the blank to conform to the closed die as shown in Fig. 2. (A draftsman's error shows the blank *l* in Fig. 1 not properly proportioned, it being obviously shown as too small to fill the die; but the intention is clear). Figures 1 and 2 contain the disclosure essential in this case. It is obvious that the blank *l* is of substantially the same volume as the forged article shown in Fig. 2.

Holden discloses the idea of making a blank of an accurate size, so that it will insure the greatest accuracy in dimensions of the finished article. The blank is then shortened endwise and spread laterally to conform to the surface of the die. (See page 1, lines 69 to 78.) This operation might be called either "forging", "upsetting", "coining" or "shortening and thickening"; and this patent is cited to show that this operation for the purpose of securing great accuracy, is old.

The patent to Lockwood was presented by applicant in protest against the patentability of certain counts proposed in interference and its pertinence appears hereafter.

Wellman shows the forging of a railway car axle by apparatus including upsetting dies *I* in which conical points i^2 are used to center the shaft for subsequent turning in a lathe. (See Fig. 5, and page 2, lines 32 and 33.)

Claims 1 and 2 were formerly allowed and involved in in-
terference No. 47,230; but the operation called *coin-*
116 *ing* was then called "upsetting". They constituted
counts 2 and 3 of the interference. Applicant moved to dissolve the interference on the ground that his opponent's operation was not *upsetting*, and hence he could not make the claims of the issue. The Law Examiner held that "upsetting" did not correctly describe the operation of either party, but that the actual operations of both parties were essentially the same. (See decision of the Law Examiner in interference No. 47,230, dated February 24, 1923, last paragraph on page 3.) The Law Examiner then al-

lowed a motion to amend by adding new counts differing only from the former in the use of the word *forging* instead of *upsetting.*

The French patent was then called to the attention of the Law Examiner, who in considering its pertinency held it to be a statutory bar to applicant's right to a patent for the subject matter of the proposed counts.

Concerning proposed count 3 (substantially present claim 2) the Law Examiner said (see first paragraph on page 3 of his decision of August 29, 1923):

> "The third of the proposed counts differs from the first in the act of carburizing and hardening the green roller. This is not suggested by the French patent but it is practiced generally in the metal working art. Lockwood states that the rollers are turned in a lathe to give the body and collar nearly the desired size, 'then hardened and finally ground to the desired dimensions.' In view of this common practice, no invention would be involved in hardening the green billet of the French patent."

The interference was dissolved, and a limit of appeal was set. (See final paper in the interference file.)

No appeal from this decision was taken, and the matters in question therein are therefore *res adjudicata.*

Claims 1 and 2 are considered to be in substance
117 the same as the proposed counts 2 and 3 of the interference, differing only in the use of the word "coining" instead of "forging". "Coining" iu understood to be that form of forging in which the article forged is entirely enclosed in, and completely fills the die cavity. This is true of the French patent also. The claims are therefore rejected on the French patent for the reasons given by the Law Examiner in holding the subject matter thereof unpatentable to applicant in view of the French patent. The applicant cannot now obtain in an *ex parte* proceeding what he has been denied *inter partes.*

Claims 3, 4, 6, and 13 add to the features so considered to be unpatentable to applicant the forming of centering depressions in the ends of the rollers, which is shown to be old in the forging art by the patent to Wellman in his Figure 5, and the description referred to in the foregoing discussion of this patent.

Claims 7 and 8 are not deemed to be different from the French patent. They specify that the slug is "of substantially the same volume as the finished roller". In the French patent there is nothing to indicate that the volume of the slug is substantially changed. But the patent to Holden is cited to show that it is old to take special care to see that the slug or blank is of exactly the desired volume of the coined article, which slug is pressed endwise to shorten it and spread it sidewise against the side wall of the die. The reference is cumulative and only presents clearly what is not emphasized in the French patent, but is necessarily embodied therein.

In claims 9, 10, 11 and 12 applicant again insists on
118 describing the operation as "upsetting" notwithstanding the holding *inter partes* that the term is not correct. These claims are rejected on the ground that they differ from the method of the French patent only in the detailed structure of the apparatus made use of. Each of these claims, excepting the first three lines, relates entirely to the structure of the dies made use of.

In *ex parte* Foreman, 326 O. G. 684, the Commissioner said:

> "Patentable novelty of method claims cannot be based on positive recitations of structural limitations included therein."

This decision had reference to the inclusion of the apparatus made use of in carrying out a method, just as claims 9, 10, 11, and 12 in this case positively recite the structural limitations of the dies made use of.

Claims 9 and 10 are also rejected on the French patent, in which the cylindrical slug *1*, is of the same volume as the article to be produced in the cooperating dies *a* and *e*, of which *a* has a conical bore, *b*, of such length that the forged slug projects slightly therefrom (see Fig. 1) and is of greater diameter than the slug, and of which *e* has a radiused shallow recess *e'*, (applicant's die 9) of the same diameter as the enlarged end of the conical bore (see Fig. 2—applicant's Fig. 3) and of the same volume as the projecting end of the slug.

The rejection of the claims on the grounds stated is believed to be sound.

Respectfully submitted,

N. J. BRUMBAUGH,
Examiner, Division 14.

119 U. S. Patent Office, Board of Appeals, Apr. 23, 1928.
Mailed.

MCV.

In the United States Patent Office, Before the Board of Appeals.

Appeal No. 205. Paper No. 29.

Appeal No. 205.

Ex parte Marcus T. Lothrop.

Application for Patent filed July 28, 1921. Ser. No. 488,260.
Process of Making Conical Rollers.

Messrs. Carr & Carr for applicant.

Hearing: Jan. 16, 1928.

Decision.

This is an appeal from the final rejection of all the claims in the case, claims 1, 2, 3 and 7 being illustrative and reading as follows:

1. The improvement in the art of making conical rollers, which consists in progressively coining a slug in a series of dies of which the last is of the size and taper desired for the roller.

2. The process of making conical rollers which consists in coining a slug of substantially the same volume as the finished roller in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and carburizing and hardening said green roller.

3. The process of making conical rollers which consists in coining a slug in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and with centering depressions in its opposite ends concentric with the axis thereof, carburizing and hardening said roller, mounting it on centering spindles entered into the end depressions thereof and grinding the surface thereof while thus centered.

7. The process of making conical rollers for roller bearings which comprises shortening and thickening a cylindrical slug of substantially the same volume as the finished

roller by pressure against the ends thereof while in a conical die of the size and taper of such roller.

120 The references relied upon are:

Wellman, 422,557, March 4, 1890.
Holden, 632,462, Sept. 5, 1889.
Lockwood, 1,152,110, Aug. 31, 1915.
Renault (French), 491,251, May 28, 1919.

This application was involved in an interference with a party Bock which interference was dissolved by the Law Examiner on the ground that the issues were unpatentable over the French patent to Renault. No appeal was taken from this decision and it is therefore *res adjudicata* as to the matter passed upon.

The rejected claims 1 and 2 are substantially the same as counts 2 and 3 of the interference, and claim 7 is substantially like count 1. It is clear that the non-patentability of these claims has been passed upon and is *res adjudicata.*

Claims 8, 9, 10 and 11 contain nothing material over the preceding group of claims and are unpatentable for the same reason.

Claims 3, 4, 6 and 13 add to the subject matter involved in the interference the formation of the centering depressions in the roller while the same is being shaped in the die. This idea is shown to be old in Wellman where it is applied to the making of a car axle which, after being formed in the die, is to be placed in a lathe to be turned and smoothed. There is no invention in aggregating this step with the method of forging the roll shown in the French patent and held unpatentable by the Law Examiner. Claim 6 is also objectionable as being for a method limited by the specific apparatus.

The steps of carburizing and hardening the roll after it is formed are common practice in the art as shown by Lockwood and these features were held to involve nothing patentable over the French patent by the Law Examiner.

Claim 12 is drawn to the use of two dies in effecting the shaping or coining operation. It is not a proper
121 method as it is limited to the specific forms of the
several dies. So far as the division of the operation into two steps is concerned we do not see that it involves invention over the method of Renault who completes the

formation of the roller in a single step. Although the Examiner has not discussed this matter we are able to take judicial notice that it is common to perform forging or metal drawing operations in two or more steps instead of attempting the entire formation of the article in a single step.

The decision of the Examiner is affirmed.

Limit of appeal to Court of Appeals, forty days. Rule 149.

WM. A. KINNAN,
First Assistant Commissioner,
FRANK C. SKINNER,
Examiner-in-Chief,
EUGENE LANDERS,
Examiner-in-Chief,
Board of Appeals.

April 23, 1928.

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122 Mailed Jan. 17, 1927.

Department of Commerce, United States Patent Office, Washington.

Paper No. —4.

On Appeal to Board of Examiners-in-Chief.

In re application of Marcus T. Lothrop. Filed Jan. 20, 1922. Serial No. 530,643. Rollers for roller bearings.

Carr & Carr for the applicant.

Examiner's Statement.

This case comes upon appeal from the decision of the primary examiner in finally rejecting the claims in the case:

1. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a forming die.

2. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a forming die whereby all points of the bearing surface are concentric with the axis.

3. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends, and having

a radiused edge at each end, inside a forming die, the radiused edges in the finished article retaining the characteristic appearance of upset metal.

4. A die-formed roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, said roller being case-hardened and having its main bearing surface free from marks of finishing tools, whereby the entire case resulting from the hardening operation is preserved in the finished roller.

5. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one or both of said recesses having a rim portion whose inner surface is adapted for frictional cooperation with the driving center of a lathe or the like.

6. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for co-
122½ operation with the driving center of a lathe or the
like.

7. A die-formed roller consisting of a slug upset endwise throughout its length and axially recessed in its ends, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like.

8. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like, and the other recess having a similar band adapted for cooperation with the idler center of such lathe.

9. A roller consisting of a high carbon steel slug upset endwise throughout its length inside a forming die, and having axial recesses formed in its ends during the dieing operation.

10. A die-formed roller for roller bearings having axial depressions formed in its ends during the dieing operation, the rim portion of one or both of said depressions

comprising a narrow band concentric with the bearing surface of said roller and of steeper inclination to the axis of said roller than the surface of the portion of said recess inside of said band, whereby said band is adapted for cooperation with a lathe center or the like.

11. A die-formed roller having depressions formed in its ends during the dieing operation, one or both of said depressions having the surface of its rim portion in the form of a frusto-conical band adapted for frictional cooperation with the center of a lathe or the like to be driven frictionally thereby, and the surface of said depression inside of said band having a lower inclination with reference to the axis of the roller than said band.

12. A roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth.

13. A taper roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth.

14. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having marks as and for the purposes set forth.

15. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having radially disposed marks as and for the purposes set forth.

123 16. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having equally spaced identification marks as and for the purposes set forth.

17. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portion or portions having identification marks as and for the purposes set forth.

18. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and

characterized by having a radiused edge at the end, said edge having the apperarance of cold-upset metal.

19. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and characterized by having a radiused edge at each end, said edges having the appearance of cold-upset metal.

20. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, one end of said roller having a conical portion adapted to cooperate with the rib of a bearing cone and said roller having a radiused edge between said conical portion of the end and the bearing surface of the roller, said radiused edge preserving the appearance of upset metal.

The two following grounds are set forth by the examiner in his rejection:

1. That the claims to the article appearing in this application are not properly divisible from the claims for the process, presented in applicant's co-pending application, serial number 488,260, now being prosecuted in Division 14.

2. That the claims are not proper article claims since they merely define the article by stating the steps of the process and since the article is old as shown by Huther and Griffin, the invention, if any, resides in the process.

The examiner rules upon the patents to:

Miller, 1,392,019. Sept. 27, 1921.
Griffin, 703,405. July 1, 1902.
Huther, 1,402,071. Jan. 3, 1922.

to support his second ground of rejection. The patent to Griffin above cited is added to the record under the practice set forth in Ex Parte Mevey, 56, O. G. 805.

The claims in question are drawn to a tapered roller such as is used in roller bearings of the type which
124 are designed to take both radial and thrust loads.

The examiner holds that the claims of this application although they purport to be article claims are merely in fact process claims since they merely define the article by the steps of the process and that as such they are not properly divisible from applicant's co-pending process claims now being prosecuted in application serial number 488,260, in Division 14.

The examiner further holds that the claims are not proper article claims, that they merely define the article by setting forth the steps of the process and since the article is old as shown by patents to Miller, Griffin (Fig. 12) and Huther, the invention if any resides in the process of forming the article. The decision rendered in ex parte Fesenmeier, 302, O. G. 199; 1922 C. D. 18, is thought to be in point:

"Where the product is old, it is not patentable merely because a new process of producing it has been discovered, nor does a claim become patentable merely by including the steps of the new process."

With reference to the holding in the first paragraph that present application is not properly divisible from the process case number 488,260, it appears that the process case has received independent prosecution in Division 14 and that this prosecution has not as yet resulted in a patent, the claims having been deemed unpatentable by the law examiner in an interference proceeding in which this case was involved with the application of another party. It has been suggested to the applicant that the subject matter of this case be incorporated with the process case inasmuch as there is only one invention in the case and the article claims in this case were indivisible from the process. But the applicant has insisted upon the separate prosecution of this case as an article of manufacture. It therefore remains to determine which case should be the one to be
patented after it is found that there is patentable
125 subject matter in the invention covered by the
claims.

Referring to the claims for the article, selected claim 4 covers a die-formed roller for a roller bearing made by upsetting a slug against the side of a die of circular section, the roller being case hardened and having its main bearing surface free from the marks of finishing tools. Other claims cover the specific form of the frusto-conical indentation to cooperate with the driving center of a lathe formed simultaneously in the dieing operation. In cases of this kind the question arises whether the claims actually cover a valid process of forming the article or whether the so-called process is merely the statement of the necessary and obvious manner of effecting the product. In the decision of ex parte Fesenmeier, quoted above, it was held that the only manner in which the article could be properly defined was by stating the steps of the process. In ex parte Trevette, 97, O. G. 1173, the invention was decided to be an article and the process nothing more than a statement of the steps of producing the article. This decision was based upon the decision of the Mosler Safe and Lock Co. vs. Mosler Bahmann & Co., 43, O. G. 1115, which held that "after a patent was granted for an article described as made by causing it to pass through a certain method to produce it * * * the inventor can not afterwards on an independent application secure a patent for a method or process of cutting away the metal and then bending it so as to produce the identical article covered by the previous patent which article was described in that patent as produced by the method or process sought to be covered by taking out the second patent." In this case the process patent was decided to be invalid.

The applicants in this case have conceded that it is possible to have this invention covered in a process and
126 have so claimed it in the co-pending case with slight
variations in the showing of specific features, and have subsequently filed this application covering the invention as an article in claims which are held by the examiner to be nothing more than an expression of the various steps by which this article is produced rendering these claims substantially identical and synonomous with the claims of the process case. The process claims if allowed would result in a patent for the same invention as that covered in this application. In one or the other of these applications a final adjudication must be had as to the merits of the claims. As heretofore stated the form of the article is shown in the patents to Miller, Griffin and Huther, cited above, in both of which is described rollers having recessed ends. The form of the article is therefore old and invention, if any, is held to reside in the process of formation.

Respectfully submitted,

A. H. GILES,
Jo/emb *Examiner, Division* 45.

127 U. S. Patent Office, Board of Appeals. April 23, 1928. Mailed.

In the United States Patent Office Before the Board of Appeals.

Appeal No. 1008. Paper No. 18.

Appeal No. 1008.

Ex parte Marcus T. Lothrop.

NLH.

Application for Patent filed January 20, 1922. Serial No. 530,643. Rollers for Roller Bearings.

Messrs. Carr & Carr for applicant.

Hearing: January 16, 1928.

Decision.

This is an appeal from the action of the primary examiner finally rejecting claims 1 to 20, inclusive. Claims 1, 4 and 12 are illustrative of the appealed claims and are as follows:

1. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a forming die.

4. A die-formed roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, said roller being case-hardened and having its main bearing surface free from marks of finishing tools whereby the entire case resulting from the hardening operation is preserved in the finished roller.

12. A roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purpose set forth.

128 The references relied upon are:

Griffin, 703,405, July 1, 1902.
Miller, 1,392,019, Sept. 27, 1921.
Huther, 1,402,071, Jan. 3, 1922.

The claims are drawn to a roller adapted for use in roller bearings. It is formed by placing a cylindrical slug in a die of circular cross section and upsetting the slug endwise until it conforms to the shape of the die. This operation, in the form illustrated, produces a tapered roller. The upsetting dies are provided with centrally located projecting points which form axially located conical recesses in the ends of the roller. These conical recesses may be surrounded by frusto-conical bands adapted for cooperation with a lathe center or the like. These bands have markings thereon to indicate origin or grade. The roller is case-hardened and ground and polished, these being customary operations in the manufacture of bearing rollers.

The claims stand rejected on two grounds. The first ground is that the claims define the article by reciting the method of making it and therefore are not divisible from the claims in appellant's co-pending application Serial No. 488,260 for the method of making the roller. That case is also before us on appeal and in our decision of this date therein we hold the method claims unpatentable. Therefore the question of division need not be further considered.

As to the shape of the roller the claims of the instant case do not patentably distinguish from the prior
129 art. The patents to Griffin and Huther show that
it is old to provide tapered rollers of this character with axially located conical recesses in their ends. The patent to Miller shows a recessed end of a roller having a frusto-conical band surrounding the recess. There would be no invention in duplicating this shape at both ends of the roller, in view of either Griffin or Huther. Nor would it be invention to use the shape disclosed by Miller, at the opposite ends of the roller shown in Fig. 12 of Griffin. Invention can not be predicated on the provision of indicating marks on the frusto-conical bands.

It remains to be determined whether the claims define a patentably new article by virtue of their reference to the method of manufacture. It is not new to form rollers by forging, hardening and grinding operations. This is disclosed in the patent to Lockwood, No. 1,152,110. It is also old to forge articles from cylindrical slugs by upsetting the slugs endwise in dies of circular cross section, as shown in the French patent to Renault, No. 491,251. Furthermore, the patent to Wellman, No. 422,557, discloses apparatus for forging car axles in which endwise upsetting dies are used. These dies are provided with conical points for centering the axles for subsequent finishing operations in a lathe. All of these references are of record in appellant's companion case and were relied upon by the examiner in holding the method claims unpatentable.

Forged rollers being old, as disclosed in Lockwood, we believe appellant did not exercise invention in using the old steps of metal working, disclosed in Renault and Wellman, in shaping his rollers. The case-hardening and
130 finishing operations are disclosed in Lockwood, and
since there is no patentable novelty in the particular shape appellant imparts to his rollers we find nothing in the claims which warrants their allowance.

The decision of the examiner is affirmed.

Limit of Appeal to Court of Appeals, forty days. Rule 149.

WM. A. KINNAN,
First Assistant Commissioner,
FRANK C. SKINNER,
Examiner-in-Chief,
EUGENE LANDERS,
Examiner-in-Chief,
Board of Appeals.

April 23, 1928.

131 In the Supreme Court of the District of Columbia.

In Equity.

No. 48859.

MARCUS T. LOTHROP and THE TIMKEN ROLLER BEARING COMPANY, Plaintiffs,

vs.

THOMAS E. ROBERTSON, Commissioner of Patents,
Defendant.

Final Decree.

Filed Jun. 27, 1930.

This cause having come on to be heard and having been tried in open court and argued by counsel for the respective parties and submitted to the court upon the pleadings and proofs adduced, and upon consideration thereof, it is

Ordered, adjudged and decreed that the Bill of Complaint in this cause be and the same hereby is dismissed with costs to Defendant.

WENDELL P. STAFFORD,
Justice.

June 27, 1930.

From the foregoing decree the plaintiff notes an appeal to the Court of Appeals of the District of Columbia, which appeal is hereby allowed and bond is fixed at $50 cash, or in lieu thereof $100 Bond.

WENDELL P. STAFFORD,
Justice.

June 27, 1930.

132 *Memoranda.*

July 18, 1930.—$50 deposited by Herrick for Plaintiff in lieu of bond on Appeal.

Statement of Evidence filed.

Assignment of Errors.

Filed July 18, 1930.

* * * * * * *

To the Supreme Court of the District of Columbia:

Now come Plaintiffs in the above entitled cause and file the following assignment of errors on which they will rely upon their prosecution of the appeal in the above entitled cause, from the decree made by this Honorable Court on the thirteenth day of June, 1930:

1. The court erred in dismissing plaintiffs' Bill of Complaint.
2. The court erred in not granting plaintiffs the relief prayed for in said Bill of Complaint.
3. The finding and decree of the court is contrary to the greater weight of the evidence in the case.
4. The decree of the court is contrary to the law applicable to the facts of the case.

5. The court erred in holding that the subject matter of application Serial No. 488,260 does not constitute patentable invention.

6. The court erred in holding that the subject matter of application Serial No. 530,643 does not constitute patentable invention.

133 7. The court erred in not holding and decreeing that Lothrop application Serial No. 488,260 sets forth and describes a patentable invention for which plaintiffs are entitled to receive a patent.

8. The court erred in not holding and decreeing that Lothrop application Serial No. 530,643 sets forth and describes a patentable invention for which plaintiffs are entitled to receive a patent.

9. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"1. The improvement in the art of making conical rollers which consists in progressively coining a slug in a series of dies of which the last is of the size and taper desired for the roller."

10. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"2. The process of making conical rollers which consists in coining a slug of substantially the same volume as the finished roller in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and carburizing and hardening said green roller."

11. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"3. The process of making conical rollers which consists in coining a slug in a conical die or dies to form a

green roller of approximately the size and shape desired for the finished roller and with centering depressions in its opposite ends concentric with the axis thereof, car-
134 burizing and hardening said roller, mounting it on centering spindles entered into the end depressions thereof and grinding the surface thereof while thus centered."

12. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488, 260, namely:

"4. The process of making conical rollers which consists in coining in a conical die or dies a slug of substantially the same volume as the finished roller to form a green roller of approximately the size and shape desired for the finished roller and with its ends adapted to cooperate in centering said roller in a grinding machine, carburizing and hardening said roller, centering it in a grinding machine and grinding the surface thereof while thus centered."

13. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"6. The improvement in the art of making headless conical rollers which consists in placing a slug of the volume required for the roller inside a conical die whose bore is of simple conical form and upsetting the slug against the wall of said conical bore of said die, the plunger and knock-out members that cooperate with said die each having a conical projection adapted to form an axial conical recess in an end of the roller."

14. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"7. The process of making conical rollers for roller bearings which comprises shortening and thickening a cylindrical slug of substantially the same volume as the finished roller by pressure against the ends thereof while in a conical die of the size and taper of such roller."

15. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely: 135

"8. The process of making conical rollers for roller bearings which comprises the coining of a cylindrical slug of substantially the same volume as the finished roller into a blank whose side surface has substantially the same taper throughout the greater portion of its length as the finished roller, inserting the greater portion of said blank into a conical coining die whose side wall is of the same length, diameter and taper as the side surface of such finished article, and pressing said blank endwise to shorten it and spread it sidewise against the side wall of said conical die throughout the full depth of said side wall."

16. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"9. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in co-operating dies, of which one member has a conical bore of such length that the larger end of the upset slug projects slightly therefrom, and the second member has a radiused shallow recess of the same diameter as the large end of said conical bore."

17. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"10. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one member has a conical bore of greater diameter than the slug and of such length that the larger end of the upset slug projects endwise slightly therefrom, and the second member has a radiused shallow recess of the same diameter as the large end of said bore of the same volume as said projecting portion."

18. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260; namely:

136 "11. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of steel of the same volume as the roller to be produced in a die member with a conical bore of such length that the larger end of the upset slug projects endwise slightly therefrom, such upsetting being effected by means of a plunger with a shallow radiused recess of the same diameter as the large end of said conical bore."

19. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"12. The process of making conical rollers for roller bearings which consists in upsetting a cylindrical slug of the same volume as the roller to be produced in cooperating dies, of which one set comprises a member with a bore whose bottom edge is radiused and which is conical from said edge throughout the greater portion of its length, said bore being of greater diameter than the slug throughout the greater portion of its length and of such length that the larger end of the upset slug projects slightly therefrom, and a second member with a cylindrical bore with a flaring edge in which works a cylindrical plunger whose forward stroke carries its front edge flush with the end of the cylindrical portion of said bore, and a second set of which one member has a bore which is continuously conical from the larger end thereof to the radiused bottom edge thereof, said bore being of the same taper as the product, and a second member with a dished recess of the same diameter as the larger end of said conical bore."

20. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 488,260, namely:

"13. The improvement in the art of making conical rollers which consists in forging a slug in a conical die or dies to form a green roller of approximately the size and shape desired for the finished roller and with centering depressions in its opposite ends concentric with the axis thereof, mounting it on centering spindles entered into the end depressions thereof and finishing the surface thereof while thus centered."

21. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

137 "1. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a forming die."

22. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"2. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends inside a forming die whereby all points of the bearing surface are concentric with the axis."

23. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"3. A roller consisting of a slug upset endwise throughout its length and axially recessed in its ends and having a radiused edge at each end inside a forming die, the radiused edges in the finished article retaining the characteristic appearance of upset metal."

24. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"4. A die-formed roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, said roller being case-hardened and having its main bearing surface free from marks of finishing tools, whereby the entire case resulting from the hardening operation is preserved in the finished roller."

25. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"5. A die formed roller having axial recesses formed in the ends thereof during the dieing operation, one or both of said recesses having a rim portion whose inner surface is adapted for frictional cooperation with the driving center of a lathe or the like."

138 26. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"6. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like."

27. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"7. A die-formed roller consisting of a slug upset endwise throughout its length and axially recessed in its ends, one or both of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like."

28. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"8. A die-formed roller having axial recesses formed in the ends thereof during the dieing operation, one of said recesses having a portion of the inner surface of the rim formed into a frusto-conical band concentric with the outer surface of said roller and adapted for cooperation with the driving center of a lathe or the like, and the other recess having a similar band adapted for cooperation with the idler center of such lathe.

29. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"9. A roller consisting of a high carbon steel slug upset endwise throughout its length inside a forming die, and having axial recesses formed in its ends during the dieing operation."

139 30. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"10. A die-formed roller for roller bearings having axial depressions formed in its ends during the dieing operation, the rim portion of one or both of said depressions comprising a narrow band concentric with the bearing surface of said roller and of steeper inclination to the axis of said roller than the surface of the portion of said recess inside of said band, whereby said band is adapted for cooperation with a lathe center or the like."

31. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"11. A die-formed roller having depressions formed in its ends during the dieing operation, one or both of said depressions having the surface of its rim portion in the form of a frusto-conical band adapted for frictional cooperation with the center of a lathe or the like to be driven frictionally thereby, and the surface of said depression inside of said band having a lower inclination with reference to the axis of the roller than said band."

32. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"12. A roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth."

33. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"13. A taper roller having axial recesses in its ends, the rim portions of said recesses or one of them having conical bands concentric with the axis of the roller and said ends having marks as and for the purposes set forth."

140 34. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"14. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having marks as and for the purposes set forth."

35. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"15. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having radially disposed marks as and for the purposes set forth."

36. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"16. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portions having equally spaced identification marks as and for the purposes set forth."

37. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"17. A roller having axial recesses in its ends, the rim portion of one or both of said recesses having conical bands concentric with the axis of the roller and said rim portion or portions having identification marks as and for the purposes set forth."

38. The court erred in not finding and decreeing that
the plaintiffs are entitled to receive a patent for the inven-
tion as specified in the following claim of applica-
141 tion Serial No. 530,643, namely:

"18. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and characterized by having a radiused edge at the end, said edge having the appearance of cold-upset metal."

39. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention

as specified in the following claim of application Serial No. 530,643, namely:

"19. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section and characterized by having a radiused edge at each end, said edges having the appearance of cold-upset metal."

40. The court erred in not finding and decreeing that the plaintiffs are entitled to receive a patent for the invention as specified in the following claim of application Serial No. 530,643, namely:

"20. A roller for a roller bearing made by the upsetting of a slug against the side of a die of circular section, one end of said roller having a conical portion adapted to cooperate with the rib of a bearing cone and said roller having a radiused edge between said conical portion of the end and the bearing surface of the roller, said radiused edge preserving the appearance of upset metal."

Wherefore appellants pray that said decree be reversed and that said Supreme Court of the District of Columbia be ordered to enter a decree reversing said decree appealed from.

SAMUEL HERRICK,
Attorneys for Appellants.

142 *Order for Transmission of Original Exhibits to Court of Appeals.*

Filed July 18, 1930.

* * * * * * *

On motion of Plaintiff it is hereby ordered that plaintiffs' original Exhibits Nos. 1, 2, 3 and 6 be withdrawn from the files of this Court and certified to the Court of Appeals of the District of Columbia on plaintiffs' appeal herein, said exhibits to be returned to this Court upon the termination of the proceedings on said appeal in said Court of Appeals.

PEYTON GORDON,
Justice.

Approved:
T. A. HOSTETLER,
Attorney for Commissioner of Patents.

Memorandum.

July 28, 1930.—Time to sign Statement of Evidence extended to September 30, 1930.

143 *Designation of Record.*

Filed July 18, 1930.

* * * * * * *

To the Clerk:

You are hereby requested to make a transcript of record to be filed in the Court of Appeals for the District of Columbia pursuant to an appeal allowed to the above named plaintiffs. In making such transcript of record, you will include therein the following:

1. Plaintiffs' Bill of Complaint (with two exhibits annexed).
2. Defendant's Answer to Bill of Complaint.
3. Statement of Evidence with Judge's approval thereof.
4. Plaintiffs' Exhibits 4 and 5.
5. Defendant's Exhibits as follows:
    Wellman Patent No. 422,557 dated March 4, 1890.
    Holden Patent No. 632,462 dated Sept. 5, 1899.
    Lockwood Patent No. 1,152,110 dated Aug. 31, 1915.
    Griffin Patent No. 703,405 dated July 1, 1902.
    Miller Patent No. 1,392,019 dated Sept. 27, 1921.
    Huther Patent No. 1,402,071 dated Jan. 3, 1922.
    French patent of Renault No. 491,251 dated May 28, 1919, and a translated copy.
    Palmgren (Swedish) Patent No. 47,365 of 1919.
6. Examiner's Statement before the Board of Appeals in Application Ser. No. 488,260.
7. Decision of Board of Appeals in Application Ser. No. 488,260.
8. Examiner's Statement before the Board of Appeals in Application Ser. No. 530,643.
9. Decision of Board of Appeals in Application
144 Ser. No. 530,643.
10. Memorandum of the Court's opinion, if any; and if no opinion filed, please certify to this effect.
11. Decree.

12. Assignment of Errors.
13. Order allowing appeal.
14. Order regarding physical exhibits.
15. This Præcipe for transcript.
16. Certificate of Clerk of Supreme Court of the District of Columbia to transcript made up in accordance with this præcipe.

SAMUEL HERRICK,
Attorney for Appellants.

Approved:
T. A. HOSTETLER,
Attorney for Commissioner of Patents.

Memorandum.

September 22, 1930.—Statement of Evidence submitted and signed.

145 Supreme Court of the District of Columbia.

United States of America,
District of Columbia, ss:

I, Frank E. Cunningham, Clerk of the Supreme Court of the District of Columbia, hereby certify the foregoing pages numbered from 1 to 144, both inclusive, to be a true and correct transcript of the record, according to directions of counsel herein filed, copy of which is made part of this transcript, in cause No. 48859 in Equity, wherein Marcus T. Lothrop and The Timken Roller Bearing Company are Plaintiffs and Thomas E. Robertson, Commissioner of Patents, is Defendant, as the same remains upon the files and of record in said Court.

In testimony whereof I hereunto subscribe my name and affix the seal of said Court, at the City of Washington, in said District, this 22nd day of September, 1930.

[Seal Supreme Court of the District of Columbia.]

FRANK E. CUNNINGHAM,
Clerk.

By HARRY M. HULL,
Ass't Clerk.

146 In the Supreme Court of the District of Columbia

Equity. No. 48859.

Marcus T. Lothrop and The Timken Roller Bearing Company, Plaintiffs,

vs.

Thomas E. Robertson, Commissioner of Patents, Defendant.

Statement of Evidence.

147 Testimony in Behalf of Plaintiffs.

Certified copies of the two Lothrop applications Serial No. 488,260 filed July 28, 1921 and Serial No. 530,643 filed January 20, 1922 are annexed to the Bill of Complaint.

Marcus T. Lothrop, Plaintiff, testified as follows:

Direct examination:

I am 45 years of age and have been president of The Timken Roller Bearing Company since 1928. I am a graduate of the University of Michigan in 1905 and 1906 in the arts course or scientific course, and in the engineering and mechanical course. Then I worked for the Franklin Automobile Company, the Halcomb Steel Company, and from there I came to the Timken Roller Bearing Company. I first became associated with The Timken Roller Bearing Company, plaintiff herein, as metallurgical engineer. It then was and still is making roller bearings.

I am the same Marcus T. Lothrop who filed the two applications for patents that are involved in this case, Serial Nos. 488,260 and 530,643. The process for which I filed application for patent on July 28, 1921 consists primarily in deforming a cylindrical slug of metal or piece of metal to form a Timken roll, a roll for a Timken bearing, having, as its characteristic point that makes it a successful operation, the positioning of the slug truly axial in the die. You start with a cold drawn rod or coil, from which you sever a small piece of metal equivalent in weight to the roll which you are going to make. You do that, preferably, without any loss of material, by shearing. That is 148 then placed in a die that supports or holds that piece of metal. Being a conical die and the metal itself being cylindrical, it fits very nicely in there so that it stands perfectly upright; then you bring your punch and die together, which wedges, on one end of this slug a slight taper, and creates on the other end a slight impression. The article then is transferred to another die. The original operation means simply being able to position the piece perfectly in the second die, and the second die comes into operation and the piece is formed up to its finished green shape. The shape of this second die is the shape of the roll that you are making. The rolls are all conical or tapered rolls, as they are called.

Referring to Plaintiff's Exhibit 2, the operations performed with reference thereto are these. This is the first operation, removing by shearing off a slug that is cylindrical, the ends of which are approximately truly perpendicular to the axis of the piece. This is the second operation, whereby this end is slightly reduced by a punching or driving it into the die, somewhat centered here, that acts as a way of piloting or holding this piece so that in the final die it can be squeezed into its final form without any flash, and with the centers in it. Otherwise the point is
149 that, if this piece twists ever so little, you will get a condition where it is not filled out on one side and a great big flash will develop on the other; or if it twists ever so little and you would make a full stroke, you have to allow so much material that it will be flashed all around. If you develop this flash, it makes this unfit for the purpose for which you are working. We have the only case I know of where, if any flash is produced, your product is a failure. In the ordinary upsetting of plates and bolts, flashes are necessary, because they are used for holding the work in operations later. In our instance, if we could not do this without flashes, the process would be a complete failure; and also if it cannot be done with supreme accuracy. For example, here is a human hair; mine happens to be two and one-half thousandths of an inch thick, some are two thousandths and some four thousandths, and (in making rollers) we think in terms of one-tenth of a thousandth of an inch. In other words we are splitting our hair some thirty times and dealing with dimensions that are very minute for a roller bearing to function properly. If we

could make it to zero, we would make it to zero. The nearer we approach the zero, the greater load we can carry and the greater work we can do with a given amount of material.

I invented this process that I have just described around 1916. I filed my application in 1921. I account for the delay from the fact that, when we had the idea, we were unable to devise the complete mechanical means for accom-
150 plishing it. We would sometimes get a roll just right;
then we would not get it just right, and we had to work around and get our details worked out, and those things are sometimes very troublesome. You have an idea, but to get it really workable takes some time. We were very busy during the war, and partly with the work after the war. I had charge of research, among other things. As for war contracts we made all the bearings for the military trucks. That interfered with the time required to produce the result desired. My company worked twenty-four hours a day at that time.

At the time I made my invention the process that was then used for making rolls for roller bearings was what we call a screw machine process. They were largely done on four-spindle automatic screw machines, in which the rods were larger than the finished product and we, in a sense, whittled them out with cutting tools. That was roughly the method. It had a great many ramifications and steps. Plaintiff's exhibit 1 will illustrate the old process that was used at the time my process was invented. This is a rod. You first have a roughing tool come in and the rod spins around and you form that; then you have to have a finishing tool, because these surfaces were too rough to be ground. In explaining the reason these surfaces are too rough to be ground, when you grind a piece of metal with a plunger cut, the grinder is going right straight into it. The imperfections of the piece you are grinding are reproduced in
151 the wheel and they cause microscopic defects on the
finished piece when you grind the next piece; that is where you have to use the finishing process. Then of course the rod is faced on the end and drilled on the end for grinding, because you have to spot the piece on centers; your male or female centers for grinding; then of course you cut off. These nibs are necessary for holding for grinding on the female centers, because you could not put a cen-

ter in both ends on these machines; you naturally could only put it in where you could get to it. Then of course we go through the carburizing and hardening operations, which produce the necessarily finest metallurgical structure for a good roll, break this nib off, after the finishing, and grind that bright, and you have a finished roll. The trend of modern manufacture is that, if you can do two things at once, you can do them better in relation to each other than if you do them one at a time; so we are always trying to reduce the operations, if we wish for accuracy.

My finished product differs from the rolls that resulted from the screw machine process to such an extent that you can identify one as compared with the other absolutely. You can identify them by looking at them, and you can identify them by the fact that your vehicle, or your line shaft, or your electric motor, will run possibly once or twice longer than it will with the other roll. It will run more years, or more numbers of revolutions, will give you greater life, or you can use smaller bearings to do the same amount of work.

152 In regard to the rolls themselves, I could compare the roll produced by the old process with the roll produced by the new process better, if I could just make a little sketch on the blackboard. (Witness makes sketch on blackboard.) A piece of steel has what we call directional properties in it. The steel is worked in this direction. There are more or less directional properties in a piece of steel, shown by lines like this (referring to lines substantially parallel to axis in blackboard sketch). If you make a roll by the old process, you cut that roll out with a tapering tool, which looks like this (indicating). You can readily see in this cutting process, where you do it on a screw machine, that you cut across the fibers of that material, and where these fibers come out to the surface you have these defects, and that roller will develop flaws at those points, and, when it does, the bearing is finished. The roll, by this upsetting process, is made of material with the same characteristics, but because of your setting of the die, this original material has lines flowing like this (indicating lines substantially parallel with the axis); those would likely flow like this (indicating lines substantially parallel with surface), and when the surface is ground, if

your centers are true, you grind off one, two, three or four of those so-called fibers and have a surface that has not the weak condition of the other character of surface. Also the end of the roll reacts axially against the cone rib to take a part of the thrust. We have then this condi-
153 tion; those lines impinging upon the thrust rib on their ends, and that being only sliding, you slide them across the end of the rib whereas here you have the perfectly true rolling. That is the physical fundamental of the advance of the "upset" roll, as we call it, as compared with the screw-machine or turned roll.

Now the other point in the superiority of the roll is this, that in the screw machine roll, there is a little button on the end here and a slot in here (indicating roll neck). Those buttons in the hardening operation distort, sometimes they will be like this, and will break; and sometimes like that, and that means that they are not in true center relation, and when you put them on your grinding machine, the thing wabbles around in a very peculiar manner and you get an irregular cutting off of the surface; and you have, instead of a zone of hardness here, we will say roughly point 2 degrees on the Rockwell scale, you might cut through so at this point that you have forty on your scale and sixty-two up here, and, because of the difference, it reacts differently, and also it wears differently, because it wears in relationship to the hardness. The Rockwell scale is a well known scale for measuring the hardness of iron and steel, similar to the Brinell tests, or scleroscope test. They are convenient tools for measuring the hardness of steels.

That the cutting in different places results in different hardness is due to this: First, in the roll we must have a hard, tough center, and a resistant outside, so we caseharden this thing. We have on the outside of this
154 (referring to a roll), we will say, 100 percent carbon, and that varies, it gradually decreases as you go in, and as your carbon decreases, your hardness decreases. The heat treatment refers first to the carburizing that puts the carbon in here regularly, and the carbon curve decreases, from 100 percent, down to, say, 20 percent, one-thirty-second inch below the surface; so therefore the tendency would be that it would decrease in hard-

ter in both ends on these machines; you naturally could only put it in where you could get to it. Then of course we go through the carburizing and hardening operations, which produce the necessarily finest metallurgical structure for a good roll, break this nib off, after the finishing, and grind that bright, and you have a finished roll. The trend of modern manufacture is that, if you can do two things at once, you can do them better in relation to each other than if you do them one at a time; so we are always trying to reduce the operations, if we wish for accuracy.

My finished product differs from the rolls that resulted from the screw machine process to such an extent that you can identify one as compared with the other absolutely. You can identify them by looking at them, and you can identify them by the fact that your vehicle, or your line shaft, or your electric motor, will run possibly once or twice longer than it will with the other roll. It will run more years, or more numbers of revolutions, will give you greater life, or you can use smaller bearings to do the same amount of work.

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your centers are true, you grind off one, two, three or four of those so-called fibers and have a surface that has not the weak condition of the other character of surface. Also the end of the roll reacts axially against the cone rib to take a part of the thrust. We have then this condi-
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their ends, and that being only sliding, you slide them across the end of the rib whereas here you have the perfectly true rolling. That is the physical fundamental of the advance of the "upset" roll, as we call it, as compared with the screw-machine or turned roll.

Now the other point in the superiority of the roll is this, that in the screw machine roll, there is a little button on the end here and a slot in here (indicating roll neck). Those buttons in the hardening operation distort, sometimes they will be like this, and will break; and sometimes like that, and that means that they are not in true center relation, and when you put them on your grinding machine, the thing wabbles around in a very peculiar manner and you get an irregular cutting off of the surface; and you have, instead of a zone of hardness here, we will say roughly point 2 degrees on the Rockwell scale, you might cut through so at this point that you have forty on your scale and sixty-two up here, and, because of the difference, it reacts differently, and also it wears differently, because it wears in relationship to the hardness. The Rockwell scale is a well known scale for measuring the hardness of iron and steel, similar to the Brinell tests, or scleroscope test. They are convenient tools for measuring the hardness of steels.

That the cutting in different places results in different hardness is due to this: First, in the roll we must have a hard, tough center, and a resistant outside, so we caseharden this thing. We have on the outside of this
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bon, and that varies, it gradually decreases as you go in, and as your carbon decreases, your hardness decreases. The heat treatment refers first to the carburizing that puts the carbon in here regularly, and the carbon curve decreases, from 100 percent, down to, say, 20 percent, one-thirty-second inch below the surface; so therefore the tendency would be that it would decrease in hard-

ness. If you grind that off irregularly, you have irregularity in the hardness and it will cause trouble. If we can get a case all of one thickness, then we achieve nearer the desire to make a uniform surface. The operations by which you harden the surface are first, carburizing, and second, you harden in water or oil. And the more carbon in the article, the harder it is. And in relation to the depth of penetration, the further in, the less carbon. If you go in, a thirty-second of an inch from the outside and the outside be 1 percent carbon, a thirty-second of an inch in from the outside you will be down to .20 carbon. .20 carbon is soft steel, very soft and very tough. 1.00 is tool steel, it is very hard to cut and very resistant to wear. The disadvantage of grinding a hardened roll is that, if you grind out an excessive amount, instead of having 1.00, you might grind down to .70 carbon. Depending on how far you go in, you grind out more and more, and as your carbon reduces, your resistance to wear also reduces. Furthermore, in grinding, you must consider the work of grinding, the number of cubic inches of material you grind away
155 in the course of a day; therefore, if you grind two
one-thousandths of an inch off of this thing, it would cost you ten cents; if you grind four one-thousandths of an inch it will cost you twenty cents. It is purely relative to the amount you have to grind off.

Speaking of the cost, I would compare the cost of the rods, the bars, as you get them, and the cost of the product made from those bars per ton. The selling price of rails, I think, is around $30 a ton, and the kind of steel we have to use to make bearings from sells in the neighborhood of $120 a ton, and the selling price of Timken bearings, after we get all through, might be $2000 a ton. To make that more expressive, I think I could point out this example, that out of every 100 tons we make, we can only ship 17 tons of Timken bearings; that in the fabrication of the material to the finished bearing, there is a loss of, from 100 tons, we have only 17 tons to ship. That shows, in a sense, the great amount of labor and the great amount of operation required to put out an article of this kind. That is true of all these precision article-. The losses are very high, and we have so much cutting away and so much work to be done—the amount of labor put into the product is perfectly tremendous. I am now speaking of the cups and cones and rollers. The roller, I would say, would be somewhat higher in shipping weight than the whole bearings but not much.

As for other disadvantages due to grinding of course, if the surface of the roll, after carburizing and after preparing, as we used to do in the screw machine op-
156 eration, is defective, in the grinding, and what we
call plunge-cut grinding, where it goes right in to those defects, they are transferred to the wheel, and to other rolls, and the result is you get a batch that hasn't as good a surface as you would like to have, and those surfaces, if used, result in noisy bearings. People do not like to have noise in their axles. Or it results in too rapid wear of the bearing itself so that they get quickly out of alignment. Therefore, in the old method, you started with as good pieces as you could, or at least pieces that had no defects that will appear in the bearing. Take a cold-drawn bar with any defect, including the fact that there is always a little line in that direction. Now the grinding wheel, coming across here this way, it goes over that in just that way (indicating); it does not hurt the grinding wheel, where the tears are all sorts of shapes, and the chatters. In other words, we can get a superior roll, a roll superior to that which we could get with a screw machine.

As for difficulties in our earlier stages; in the old method of gripping the little button on the end of the roll, it was very difficult to get those so they would grip regularly, and we did have a little slip, and when they slipped they would make a flat spot on the roll. With the method of the recess centered in the roll,—where you put the centers in this way (illustrating)—it is perfectly possible to put any amount of force necessary on that, because it is just
157 straight compression and once you have your ma-
chine set, it cannot slip. You always set it up tight enough so you will never have a slip. We had a great deal of trouble in that type of roller.

Comparing this new roll with the old roll, we had (in the old roll) the button on the one end, and the center on the other. Now, we put centers on both ends and make the centers of such a form that, when you come up there, the frictional resistance is such that it not only centers but drives the roll for the operation of grinding the body. Those three different centers are embodied in this one exhibit, Plaintiffs' Exhibit 3. We at first had these slots (indicating same in Plaintiffs' Exhibit 3). We later found we did not have to have them. Then we modified the shape of the centers so as to get sufficient friction.

These slots function also as a method of identification. By this method you could identify this roll, it being like another roll very similar to it in taper. That is, in other words, the two rolls are very similar in taper and it is hard to tell them apart, we dealing with such small dimensions.

Referring to the selling price of our present rolls as compared with the selling price of rolls made with the old process, as, for instance, in 1914, our prices have been consistently on the downward path since 1914, and today are roughly fifty percent less than they were then. That
158 is, the cost of the present bearing is fifty percent less than the old bearing was in 1914.

As to the number of rollers that we have made by this process, I do not know how many we have made in total, but we have a plant in Canton, and one in Columbus that is capable of producing 5,000,000 roller bearings a month. There are roughly 14 rolls in a roller bearing. I should think we made over a billion of these rolls last year. They are used in roller bearings here, and are shipped to France, Germany, England and are used over there. The rollers are made here and shipped over there to assemble into bearings. There is considerable trade abroad in these rollers as distinguished from the completed bearing. We cannot make the completed bearing in this country and ship it to Europe on account of the fact our costs are too high; but we can make rollers of better quality and ship them to Europe than they can make over there. I think we are shipping abroad a million rollers of this type a week.

Cross examination:

We make about five or six hundred sizes of roller bearings. We make them from very small ones of this size (indicating assembled bearing) up to as large as,—the largest one we have made is 62 inch diameter, a little over five feet. They serve all industries, the big ones for 159 cement mills, the little ones for little small fractional horse-power motors. They are built in all sizes. Referring to the bearings of 62 inches in diameter, these are made in a number of rings. Probably three inches would be the length of that ring; then if you want more capacity you put one, two, three, four, five or six of those on in tandem. These large size conical bearings are not made by the same process. First they are not made in great quantities and the mass of the material is so great that there has not yet been devised machinery big enough to do it by this process; and if you did have it, we would have so little production, they would only run a few out each day. The big bearings are made specially. I would say that 95 percent of our production, however, is made by this process, because the bulk of the production is smaller bearings.

Bearings were first put out by us under this process for the open market in 1921 or thereabouts.

William Earle Umstattd, witness in behalf of the plaintiffs testified as follows:

Direct examination:

I am 35 years old, reside at Canton, Ohio; am factory manager of The Timken Roller Bearing Company, with which I have been since November 1919. Referring to Plaintiffs' Exhibit 1, it is the screw machine roll that we made when I first came with the company in 1919, and made up until 1921, when we commenced to abandon 160 that method and take up this method here, referring to the upset roll Plaintiffs' Exhibit No. 2, as far as we could supply the proper machinery.

I have prints or diagrams (marked Plaintiffs' Exhibit No. 4) that will illustrate the two processes, that is, the old automatic screw machine process and the Lothrop process that is here in issue. Referring to these prints, this piece here is a piece of straightened wire stock about 12 to 16 inches in length. It must be perfectly straight. It is then put in a spindle, a screw automatic device, and a forming tool cuts in and roughly forms this piece, the forming out being shown by this cut-out piece here. After the rough form is made, it is necessary to put a finishing tool in, that we call a shaving or finishing tool, which gives a smooth finish to the roll and puts it in proper condition for grinding. After that is done, the end must be formed at a 20 degree angle on our rolls and an end roll comes in and cuts that angle. Then we must put a center drill in, in still another operation, another tool comes in with a drill point and drills this in here (indicating) so that the piece can be properly held when grinding. After that is done, a cut-out tool comes in, in this direction, crosswise to the roll, which is being made and cuts through this place here, and the roll drops out in a chute. After that is done, the piece is carburized and hardened and taken to the grinding department, where it is chucked and a collet is forced on the head end of the roll, and a lathe center goes into a depression on the opposite end of the roll. These parts grip the button, and by pressure being put on in endwise motion, the spindle turns and the roll turns as the 161 grinding wheel advances in to make the cut. After that is done, the roll is next taken to what we call an end-grinding operation, where it is again put to the collet and a grinding wheel advances across the angle of the roll to grind the end.

The occasion for the end grinding is the fact that our bearings depend largely upon the ability to take a thrust as well as a cross strain. In addition to taking a radial load we must also take a thrust load; and that is the only way that can be accomplished on the end there. After grinding the end, we take the roll over to another department and snap the head off. That has been hardened and of course is rather fragile, because the neck goes in that pointed manner. After that is snapped off, it leaves the small end of the roll in a rather rough condition and it is necessary to put that on a wheel, such as a disc grinder, in order to grind those projections off; then the roll is finished.

By the term "upset process" I simply mean the process invented by Mr. Lothrop. The "upset method" is the method by which a slug or blank is cut from a coil or rod of wire and is forced or wedged into a tapered die, where it is held in true relation to its axis until a second puncher comes in and upsets or deforms or coins the piece into a true tapered roller with the proper angles on the end and centers in both the small and large end.

"Slug" is a term we use in the trade. It is really just a blank piece of metal of the proper mass to pro-
162 duce the finished green roll. It is then forced into a die about one-third of its length, which gives it a slight taper there (indicating the end of the slug) and holds it in true relation to the axis of the roll and prevents any tipping action either one way or the other. The work is then put in a second die and a punch comes in and hits the roll and forces it all the way into the die and gives it the appearance of the finished roll. That roll is finished up by carburizing and hardening; then it is taken to the grinding machines where it is put on two simple centers; so we do not have a complicated collet in this case. Pressure is applied on these centers sufficient to grind the roll. It is then taken to the next operation where it is put into a collet and the ends ground on the roll similar to the operation of the screw machine roll. This roll is then finished.

Plaintiffs' Exhibit 4 indicates the comparative cost in the operations in these two processes, that is to say, the old screw machine and the "upset" or Lothrop process. Plaintiffs' Exhibit 4 was prepared by our cost department and checked by our statistical department and myself. I have general supervision of those departments. As for the comparative costs of these operations under the two processes, first is the comparison of the material cost for the size numbered 302 roll. That is the roll that is exhibited here on these boards, Plaintiffs' Exhibit No. 2. I am comparing one with the other, the screw machine operation with the upset operation, the final products being the same in size. The cost of material included in the screw
163 automatic process is $3.23 per thousand; in the Lothrop process it is $1.60 per thousand.

The diagrams (Plaintiffs' Exhibit 4) illustrate the saving. This is based on the screw automatic process, being 100 percent cost, and the Lothrop cost is 48.7 percent of the screw machine cost, or a saving of 51.3 percent. That is sheet No. 11 of Plaintiffs' Exhibit No. 4.

The next great saving we have here is in the comparison of labor cost, shown on sheet No. 12. The cost of labor for the automatic screw machine process is $3.44 per thousand; for the Lothrop process it is $1.05 per thousand, or 30.7 percent of the screw machine process, showing a saving of 69.3 percent.

Plaintiffs' Exhibit No. 5 comprises additional diagrams and figures illustrating comparative costs of the two processes. For instance, the cost of tool maintenance between the two processes. The cost of tool maintenance by the screw machine process is 23.7 cents per thousand; by the Lothrop process it is 7.2 cents per thousand, or 30.4 percent of the screw machine maintenance cost, or a net saving of 69.6 percent by the Lothrop process.

Ten screw machines are required to produce the same number of rolls that are produced by one "header". By "header" I mean a cold upsetting machine, a machine that does the work of upsetting cold metal. By "upsetting" I refer now to the shortening of the slug and 164 thickening thereof at the same time against the walls of the die. The slug is placed in the die and shortened lengthwise and thickened sideways.

There is another exhibit here that I think should be mentioned, and that is the floor space required by the screw automatic process and the floor space needed for the upsetter process. By the floor space, I mean the number of square feet which would be occupied by the screw machines as compared with the number of feet which would be occupied by the headers or cold upsetters to do the same amount *to* work, to turn out the same monthly production. By the screw method process we would need 100,300 square feet of floor space: by the Lothrop process we are using only 8,750 square feet, or a saving of 91.3 percent in floor space. Roughly our floor space costs us, to put up a factory today, three dollars per square foot, without buying the ground. It is rather difficult to say what the ground is worth. Recently, when we have expanded our plant, we were asked as high as $85,000 per acre for ground which would have to be purchased, or roughly two dollars a foot. That would bring the total up, with the building and ground, to about $5 a square foot. By this present process, we save 91.3 percent of that space.

I have data showing the saving in scrap of the
165 Lothrop process as compared with the old screw machine process, and I can tell you from my own memory what the saving is in that respect, and what the saving is in inspectors.

The saving in inspectors is, roughly, $750 per day per working day. I arrive at that figure in this way: We would have to have 250 girl inspectors at about $3 per day each to inspect our rolls were they made by the screw machine process. Since we are making them by the cold upsetting process, we have dispensed with that inspection, have not found it necessary, and we save the salaries or wages of about 250 girl inspectors per day. In addition to that there were workmen required to keep our inspecting machines in order. That is a cost that is rather difficult to obtain. We do not keep those costs individually. That just goes in as a general charge against the entire inspection department, so I am not able to say just what the items amount to.

I have data there which has been carefully kept for years, ever since I have been with the company at least, I know, as to the amount of scrap produced in each department. By "scrap," I mean the pieces which must be thrown away, and which in our case go back in the furnace to be remelted and poured out in new blooms and made into ingots, bars, tubes or rods, or similar pieces of steel for remaking into bearings. "Scrap" includes the shavings and grindings from the machine. The shavings and turnings or grindings are contained in this scale of material cost of the
166 screw machine as compared with the upsetter in these exhibits. The scrap, however, is not included in there. The scrap from a period of 1920 to 1923, on rolls produced on the screw machine, showed that we scrapped 1.8 percent of our green product and that we scrapped 3.1 percent of our finished ground product, making a total of 4.9 percent rolls scrapped, upon which we did a great deal of work and spent a great deal of money, besides the material. These figures mean practically that one out of 20' of our rolls or about 5 percent were thrown away as waste. I might mention the figures for 1929 on rolls scrapped, made by the upsetter method, showed 75/100 of one percent, which were rejected after grinding and which was all the scrap which was made by that process. In other words,

three-quarters of one percent is all we rejected for any reason of the rollers made in 1929.

Referring to Exhibit 6, I will explain defects, whether illustrated there or not, that would be responsible for scrapping, or would require further work. By the screw machine process, a slight inattention on the part of the operator in not pulling the chips away from his cutting tool frequently caused a piece of steel shaving to fuse on the edge of the cutting tool, the forming tool, or shaving tool, or drill, or something of the sort, which would produce a tear. That is commonly known with us in our inspection department as a torn roll, and is "scrapped" if the tear were at all bad.

167 Other defects were those as off-taper. If a tool would become a little out of adjustment in the machine and cut the roll off-taper, it would be necessary to throw the roll away, if the degree of off-taper was of any appreciable amount. If the roll tore on the end, so that the grinding wheel would not clean up the tear, the roll was thrown away. If a center drill snapped or broke or the lip broke off of it, or the edge broke off of it, that would put a bad center in the roll and that center would not accommodate the center of the grinding machine and for that reason we threw it away in the green process rather than putting any more money into it, such as carburizing and hardening. Frequently small nicks and ridges were formed on the rolls by the press, or cutting and chipping out and causing a portion of the roll to stick out here beyond the rest of the surface of the roll. Those rolls had to be thrown out because of that, because the grinding wheel in hitting that ridge would develop a crease in it which would be transmitted to other rolls; instead of spoiling or losing one roll, we would probably lose hundreds of rolls, because each of our roll grinders, operators, attended to some four or five grinding machines, and he could not be constantly at each grinding machine to be sure that a chattered roll or a torn roll or a roll with a ridge on it should not go into the machine. A chatter, such as shown in this exhibit,
168 is a very bad thing for a grinding wheel. It would cause the wheel to jump in the spindle a little bit when it hit these chatter marks, and at times would throw the grinding wheel spindle out of balance, meaning that it would have to be turned down and scraped in again, and

the grinder put out of commission for probably anywhere from several hours to a day or more. Those are some of the defects. I could go on probably for half an hour naming defects that occur in any screw machine-made rolls. They are thoroughly eliminated by the Lothrop process. There is no chance for any of these things I have mentioned to occur on rolls made by the Lothrop process.

Referring to these depressions in the ends of that roll, we put other marks in beside the centering marks. One of those you will notice has a square impression in the end that is used simply as a distinguishing mark, to distinguish one of these rolls from another. The rollers are identical in diameter at the large end. If a roll, however, is three degrees, eight minutes in taper, and another is four degrees, which is rather a small degree of difference and cannot be noticed by the eye, and if these rollers were to become mixed in a bearing, it would cause an entire failure of the bearing; so this means of identification prevents any such mixture or confusion. The cost of putting those identification marks in is so negligible that I would hate to try to mention it. It just means grinding a little square mark on the center punch. It is almost nothing. It does
169 not affect the time of operation, loss of material, or anything of that sort—nothing but the making of the original punch. It is easy, by changing the design, to identify the rolls as of our product, or one roll of our production from another.

We make some 150 different rolls and there are numbers of them which are almost identical, which cannot be distinguished by the eye and could not be distinguished unless some identifying mark is put on them. The reason why we make so many different kinds of rollers that are so close that you cannot detect one from the other involves quite a technical explanation of our bearing. Our bearing is based on the fact that all the tapers of the cup, cones and rollers must meet at a common apex, probably in some cases two and a half inches from the bearing; in other cases it may be 20 inches from the bearing, depending on the size of the bearing. If an automobile manufacturer or electric motor manufacturer, or what-not, has a machine which he has been building for years with plain bearings, bronze or brass bearings, and desires to change to Timken bearings, it may be necessary for us to redesign

or make a new bearing to fit that machine. Re-designing of the machine might be very costly, he might have to scrap all his jigs, tools, and so forth, so it is a lot cheaper for us to give him a new bearing than to ask him to redesign
his whole machine. That means we may have to
170 make a roller which, instead of being four degrees,
may be three degrees fifty minutes to get the proper
sort of bearing for that application.

This appliance will illustrate the precision, that is, the extreme minuteness of the dimensions we deal with in this roller bearing art. This is a gauge we use in our grinding department (exhibiting appliance). This appliance is used for checking the work as it comes off the grinder so that the grinders keep the rolls somewhere near the proper size. Our rollers are not ground to an exact size, they are ground to an approximate size and are then gauged on an electric gauging machine or our own design to within one-quarter thousandths of an inch, so that it is necessary for us to grind somewhat close to the size, within one-thousandth or two-thousandth to the size. This gauge is used on our grinding machine, and this piece I put in now is what we call our master key, we turn that around and it stops right there; that is as far as it will go (indicating). Then I have here a roll which is size 6, or one-thousandths of an inch smaller than the other, and it goes around and stops at this 6. That is as far as it can be turned. The other one is size 8, or one-thousandths of an inch larger than the master key, and it will only enter so far, to the 8 on that gauge. To the eye those two rollers seem identical; it would be impossible to distinguish one-thousandth
of an inch difference in diameter with the eye; but
171 with a gauge such as this, which is really crude as
compared with our electrical gauge, machines which
are used for the final sorting operation, it is easy to show the difference between those two rollers.

With an ordinary Timken bearing, as we put them out in commerce, the difference in diameters of the rollers, as between the largest roll in the series and the smallest roll in that particular series, is one-fourth of a thousandth of an inch. That accuracy runs through our entire product. Excepting the ball-bearing trade I do not know of any other industrial art wherein that degree of accuracy is approximated. I do not know of any closer tolerances other than the gauge makers or people who make master thread cutting dies for cutting threads or master tapes. Those are instruments of precision. They are not actually used for cutting but simply for measuring the pieces which have been cut. They are similar to the instruments up here at the Bureau of Standards. I do not know of any product that goes out into the market for use, as distinguished from mere instruments of precision, that are intended to check up other things, that hold to as close tolerances as we do.

As for the volume of business done by The Timken Roller Bearing Company in taper roller bearings, compared with the output of taper roller bearings of the entire country, the last figures which I saw on that, which I think
172 are accurate, show that we do about 94 percent of
the business,—of the entire output in tapered roller bearings. I have an instrument here that will visualize to the Court the effect of off-center bearings in grinding. This first is a roll made by the upset method, and you can notice that between the point and the roll, as it turns, there is no appreciable difference in the dimension there. It runs true with this point (indicating). You take a roll which has been thrown off center, exaggerated, of course. This piece has been deliberately made this way in order to show the effect of a center which is off. It shows how the roll varies—you will notice how the distance between the roll and the point varies as the roll is turned. That condition existing during a grinding operation means that, on one side of the small end and on one side of the large end, a great portion of the face would be ground off of the roll; if the roll rolls true in the centers, the removal is uniform from all sides.

Cross examination:

I was with the plaintiff company when they used uniformly and exclusively the screw machine method that I have explained here. We commenced discontinuing this screw machine process and adopting the present method in 1921 and gradually kept on until the present day, when about 95 percent of our rollers are made by the
173 upset process. As an intermediate process, we used
a method of upsetting them on a punch press rather than a cold upsetter or cold header.

As for the statement that the plaintiff company manufactures about 94 percent of the tapered roller bearings, that is information which has just been gotten by our sales department and I couldn't tell you exactly where it was gathered. I cannot give you the figures the plaintiff company has expended in advertising.

Mr. Carr: We will admit it is considerable.

Redirect examination:

As for the difference between the upsetting in the punch press and upsetting in the header, the upsetting in the punch press requires a blank which has been cut off or sheared off by some method before it is taken to the punch press and is very slow in operation as compared with the cold header or cold upsetter. The operation of heading or upsetting is identical whether in a punch press or in a cold header. While the punch press is the slower operation, the operation of the punch press is much faster than the operation of the old automatic screw machine process as far as speed is concerned. A punch press is at least five times as fast as the screw machine process.

174 These rollers produced by the Lothrop process can be identified by the appearance of the metal as compared with the piece which has been machined. It is rather difficult to explain, but it is something which can be shown very easily. The two rollers have an entirely different appearance to the eye. (At bench exhibiting a Lothrop roll and a screw machine roll.) You will notice on this (the Lothrop roll) the metal just seems to have been pressed down here, no cut on here of any sort, whereas here (indicating screw machine roll) there are distinct lines where the cutting tool comes in. Perhaps I can better illustrate from this (indicating Lothrop roll). You can see more of the distinguishing mark on that on the small end as compared with this one (indicating screw machine roll) on the small end. This metal here, you see, (indicating Lothrop roll) gives the appearance of having pressed down there rather than having been cut with any sort of tool. The large ones I think are easier to see. You can see that this (indicating large screw machine roll) has been machined, you can see where the cutting tool has cut around

and formed those lines around there, whereas on this one (indicating large Lothrop roll) there is no such thing on the big end. On the small end, it is even more pronounced, shows the metal has been pressed down.

Referring to terms "upsetting" and "coining" and "forging", "upsetting" is a trade expression which means that a piece is shortened in length and thickened sideways. The operation that shortens it thickens it. "Forging" may accomplish the same result, but usually applies
175 to a hot process and to a repeated number of blows
being struck. "Coining" is almost synonymous with forming a piece very accurately, I will say, such as a coining press, or such as we do by forming these rollers, filling out a die, completely filling it out, and having a piece come out that assumes the same shape as the die into which it is forced. It carries with it an implication of precision in the final product. I think that is generally understood as being what coining means.

Mr. Carr: Mr. Hostetler has conceded the assignment of these two applications by Mr. Lothrop to The Timken Roller Bearing Company and for that reason we did not offer the formal assignments. That is correct, is it not?

Mr. Hostetler: Yes, sir.

The exhibits introduced by plaintiffs in their testimony in chief are:

Certified copy of Lothrop application Serial No. 488,260, for Process of Making Conical Rollers, as originally filed.

Certified copy of Lothrop application Serial No. 530,643, for Rollers for Roller Bearings, as originally filed.

Four physical exhibits marked, respectively, Plaintiffs' Exhibits Nos. 1, 2, 3 and 6.

Two sets of comparative diagrams, marked respectively, Plaintiffs' Exhibits Nos. 4 and 5.

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Defendant's Testimony.

Mr. Hostetler: If the Court please, your Honor no doubt will want the records of the Patent Office in these
176 cases. The bill has only the Lothrop patent applications as filed, but does not show the actions of the

Examiner of the Board of Appeals, and I believe it is agreeable with Mr. Carr that such parts of the applications as are essential may be introduced into the case. I have the official files, but they are voluminous, and really do not care to burden the record with those. For the present I wish to introduce the decision of the Board of Appeals in one of the cases certified, which I designate as D. I., Defendant's 1.

The patents cited are in the answer and I will offer them.

Mr. Hostetler: To simplify matters, your Honor, we introduce in evidence the patents cited in my answer, Wellman (No. 422,557 dated March 4, 1890), Holden (No. 632,462 dated Sept. 5, 1899), Lockwood (No. 1,152,110 dated Aug. 31, 1915), Griffin (No. 703,405 dated July 1, 1902), Miller (No. 1,392,019 dated Sept. 27, 1921), Huther No. 1,402,071 dated Jan. 3, 1922), the French patent of Renault (No. 491,251 dated May 28, 1919), a translated copy, and the Swedish patent of Palmgren (No. 47,365 dated 1919). (Said Swedish patent was formally withdrawn later.) These are the references on which we rely.

Plaintiffs' Testimony in Rebuttal.

Mr. Carr: I then have to rebut those patents, as they have been cited. Mr. Hostetler pointed out that we had two remedies, either to carry the case to the Court 177 of Appeals, which would have involved our going up on the record in the Patent Office, or coming to this Court and trying the case de novo. Now I have no objection to introducing here before you all of the matter that was before the Patent Office. The Patent Office had no machinery for finding out what this thing was: they took the things on their face and cited against us certain patents, which I want to explain by these gentlemen who are more familiar with them. It is rebuttal testimony.

Mr. Carr: First, there is the Swedish patent. There is a motion pending which has never been disposed of, but the understanding between counsel was that Mr. Hostetler will take time to consider whether it will be offered in evidence, and I believe he has withdrawn that as entirely too late to be of any significance. All the others you rely on?

Mr. Hostetler: Yes.

Marcus T. Lothrop, recalled in rebuttal, testified:

Direct examination:

The Wellman patent No. 422,557 is an apparatus for making axles for railroad cars, main line equipment, and consists in forging, in a number of blows, a large, standard A. R. A. axle. It is, roughly, 60 or 70 inches long, and has a journal on it about six to nine inches in diameter, and the largest cross-section is probably around eight inches.
178 The article is forged very roughly to shape, probably not more accurately than one eighth inch in size; and after they have the forging done, they hold this axle in a die and come up with some center pins which put centers into the ends of this axle without much regard to the relationship of those centers either to each other or to the outside diameter of the axle, because those centers are not guided and can wabble around. They only put those centers in there of sufficient depth so that the lathe can hold this axle, and the axle then is gripped by a dog to drive the roll for the operation of turning. In other words, this, to me, is a hot forging operation, making a rough, crude part that weighs hundreds of pounds, and is a method that is not in any way, shape or manner applicable to making a Timken roller bearing, and has in it none of the essentials of the method that I propose for making Timken rollers, for there is no firm manner to center the original blank. The original blank simply is out in the air and comes to a dead shape. There is no manner of centering the original blank and the precision required here is a matter of eighths of inches, where the precision required in our case is down to the thousandths of an inch. It is an entirely different thing.

I called attention to the fact there that Wellman's work is done on hot material that has significance in this regard: Take, for example, just the standard practice in rolling one-inch round steel. For example, a hot
179 rolled bar of one-inch round steel can be brought to a tolerance of six one-thousandths of an inch. That is as good as a rolling mill can do in modern mills. A one-inch cold-worked bar can be brought to a tolerance of plus or minus one-thousandth. It is the natural result of

the fact that when a thing is hot its temperature is variable. Slight differences in temperature make a great difference in the way it will squeeze down with a roll; and when it finally cools off, it cools 100 degrees hotter in one case than in another. The contraction is greater at one place than at another. In other words, you cannot control the variations of your process closely enough at temperatures of 1,400 to 1,500 or 2,000 degrees Fahrenheit, which are used in hot operations. You cannot control them closely enough to get precise articles. All precise articles are made cold.

I referred to the forging. The Wellman patent says: "for turning the axle on its axis between the strokes of dies B B′, dies I have sections i, squared" and so on. The significance of the turning of the work and of the strokes of the die is that they have to turn it in order to work it down. In other words, just like a blacksmith will do on his anvil; he turns his bar and keeps hitting it and keeps gradually working the thing into shape. These axles are
largely made from square sections. In other words,
180 the stroke of that die is similar to a hammer while
the axle is lying horizontally and is being turned.
And it is turned each time you hit it a lick; and the dies are not round. They are round with recessed edges so that any overflow of metal is not squeezed out and then reforged back in the form of a seam.

I do not find any centering dies there. They have a device on the end here that looks like a hydraulic cylinder or air cylinder which shoves a pin into the end of the axle as shown in figure 5, but there is no way of getting it accurately. As for the degree of variation from the axial position, I know what it is because I have seen these made at the Carnegie Steel Company. They do not attempt to keep those centers closer than one-eighth of an inch. The fundamental of the process that we are trying to get a patent on is not in this Wellman process at all. There is no way of holding the piece in an exact position. Referring to the statement in the Wellman patent that the conical points 1.-2 are for centering shafts for subsequent finishing in a lathe, the meaning is this: These forgings are put in centers on a lathe, and they are dogged, as we call it. A dog, or any clutching device, is attached to the end of the

axle and that acts to rotate these axles on centers so as to accomplish the machining of the axles. Then, when the axle is turned around, they machine on the other end. The tolerance with which this Wellman axle is made would be
181 roughly at least one-eighth inch, maybe one-quarter
inch. They make no pretense of making it accurate as to size, because there is a necessity in axle work of machining off a fin of excessive material that is produced in this process.

Referring to the French patent of Renault, No. 491,251, I understand that French patent. We made lots of those just like this during the war for projectile shells. The French operation is a typical method of making projectile shells used in this country by most of the shops. A die of this character is put on this hydraulic press and the blank, which is shown here in Figure 1, lettered "l," was cut to an approximate length in a rolling mill and was a hot-rolled piece of steel somewhere in diameter from 3 to 7 inches, or greater, depending on the size of the shell made, and was then heated up in a furnace and was put in a die. This die is marked "a" in figure 1. The blank, as I say, is a hot-rolled piece of steel, probably not less than one-sixth of an inch, and cut off to an accuracy not better than one-fourth inch. The die shows a slight taper, and that is necessary, not because they want a tapered finished product, but it is necessary to have it tapered or they could not get the piece out of the die. It would stick. They heat this up and put these in position here, and then they come down with a collar and end up with a piece that is longer than the original piece, because it comes
182 down on this tapered end at the bottom and that
produces a part called "E," making the part or slug 1 longer in shape, and then they take off that particular little collar, "F," which is on top there, and come forward with a punch right down into the metal and make this article shown in figure 3, which is a hot-pressed blank. That hot-pressed blank is machined all over, inside and out, and makes the shell. There is no accuracy of concentricity between the shell on the inside and the outside. Those shells have a tolerance of more than one-eighth inch, and were machined all over, and the operation was a convenient operation from the first, of getting the punch to

start and have the collar guide the punch—the guiding of those collars is also at a tolerance of one-eighth of an inch, because done hot. If it had a smaller clearance the thing would just have bound up, because of the expansion and contraction. It is again the question of making the mass hot, with big variations in size, as against making the same mass cold to minimize variations in size. And I frankly can see no suggestion in this method of the way we finally head in making the rolls.

The product of this French patent is something that is raw material to be further worked on. The taper of the French patent is of the standard practice in hot-forging dies; you taper your die slightly to relieve the effort of extraction and relieve the wear and tear on your die
183 in extracting the material. If it binds up there pretty tight, it squeezes and destroys the die and destroys the piece itself. If the hot billet was allowed to cool in that die, it would go in the plunger so tight you could never get it off. In fact, that was one of our troubles; five or ten percent of the shells that were made never did get off the plunger and had to be cut off with a torch in order to save the plungers. The plungers are made of a very expensive high grade of steel, and the shell, of course, is a hollow article. A roller bearing roll is not hollow, it is solid. That is one of the essentials for roller bearings.

Referring to Lockwood patent No. 1,152,110 the Lockwood roll is a coil or ribbon of steel. They coil them, they cut across them (figure 9); they put it on an anvil under some dies, as shown in figure 8. The dies are not round like a bearing—and they forge that die onto this mandrel pin, which is tapered, into a taper shape by a number of blows like that, and that they do either hot or cold, and the result then is that they have an article as shown in figure 6. That is what they call a swaging operation, which are just a number of blows and the article is hollow. Frankly I cannot figure it as anything like we have. The Lockwood roll has an enlarged head at one end. The effect of that head, if it took a thrust at the end, would be that that roll, looking at it at the end, would have these spiral seams around,
184 and they would have to impinge against the rib of the cone. Where the thrust action came, that spiral

seam acts as a cutter and cuts away the metal. It would not be a thing that could be operated in a tapered roller bearing, and has never been so used. The Lockwood people are straight-roller bearing manufacturers, and this has never been produced. There is nothing in the Lockwood roll that can be used as a center for grinding, and the fundamental of what we do is not there, which is the holding of the piece in an exact position so that it can be formed with accuracy. That fundamental is not here.

Referring to the Griffin patent No. 703,405, it shows a typical tapered roller bearing and a device for holding the rolls on the inner member or cone. The device is a cage which guides the rolls; and these little pins keep the rolls from falling out of position. It is not a patent for a roll at all. It functions as a cage from the fact that the pins hold the rolls from falling out of the cage and the side members of the cage keep the rolls in alignment so they do not slue around when the bearing is in position. The rolls are required to turn on pivots in end rings when the bearing is in operation. Otherwise it would not be a friction bearing. Those recesses in the ends of the rolls do not function in the friction members in connection with the centers of the grinding machine. Oh, there is nothing in the Griffin patent that has anything to do with the making of a roll. It says nothing about the grinding operation, In fact,
185 I might say that at the date when this patent was
taken out, no bearings were ground. These were all unground bearings in those days, 1902. The Griffin bearing passed out of existence before my day. I never heard of one of them. The fundamental reason why they were never made was the fact the bearing would have been so costly. The construction was too expensive and if they did not harden the bearings they would not last. There is nothing in that Griffin patent that would in any way help the designers to produce my product.

Referring to Miller patent No. 1,392,019, I know all about this Miller patent. We own the company. The end of the Miller roll was exactly like our roll, with the button on it, one end for grinding, and the other end had a button that we used for the grinding operation. The contention of the Patent Office, I believe, was that the other end might have the same as the end shown, but was not. As for the contention of the Patent Office that the Miller patent shows a

hole in one end of the roll and there is nothing to prevent putting a hole in the other end, these holes were all put in by the screw machine method, the same as our rolls, with an eye at one end and a button at the other—exactly the same. Everybody who is manufacturing rolls now-a-days makes them with buttons, with the exception of ourselves. Very few are made with buttons. Hoover and Bower are about the only ones. There is a concern called the Ordnance Manufacturing Company. That button method is the next most successful method to ours today. The button
186 process represented the most advanced stage of the roller bearing at the time I invented my process.

Referring to the form of the recess in the end of this roller of Fig. 2 of Miller patent No. 1,392,019, its bottom bore is simply a cutter socket for the drill that goes in; then the little tapered part beyond that is where it fits on the center of the grinding machine; then the large taper on the outer end is a device for holding lubricant to lubricate the end of the roll and the rib of the cone, which is shown with the end of the roll impinging against it. That is fundamentally a patent for lubrication. There is nothing in the patent from which you could learn the idea either of upsetting the roll or of forming axial recesses in both ends for cooperation with grinding centers.

Referring to Huther patent No. 1,402,071, that is also a cage construction. The bearing, in the first place, cannot operate because there is no thrust rib on the cone. This (indicating) inner race member is the cone member of the bearing here. If that bearing were put in operation the rolls would just simply come right straight out. You have got to have a rib for the roll to impinge upon. The recesses in the ends of those rolls are for the convenience of the cage construction; and if that bearing had ever been made, which I know it was not, because only one sample of it was ever made, it could not have been operated anyhow for the reason that the metal thickness on the ends of the
187 roll is so small that those ends would break off. Those depressions there are of such a shape and form they could not be used for any grinding operation. That roll could only be ground by a centerless grinding method.

Mr. Carr: If the Court please, Mr. Hostetler asks me to say that he formally withdraws the Swedish patent No. 47,365, that was set up in the answer. For that reason we will not examine in regard to that.

Referring to Holden patent No. 632,462, it is a method of making "crusher gauge plugs". In ordnance, we have to measure ter-*if*fic forces, and when the load is put on by explosion, or other means, that part then will be reduced in size to a certain amount, that is, in length. So, in order to make these little plugs very accurately they use a plug, as it shows here at "a" in figure 1, a plug that is 521/1000 of an inch in length and 320/1000 in diameter. They also are very careful not only to get to these exact dimensions, as well as they can, but they get them to exact weight, so that if it is a little bit off of dimension, they will use a file, or something, to file it a little bit; then weigh the little piece to be sure it is the exact weight. Then it is put in a die, shown at "c" here in figure 2 and they come down with a piece of machinery and feed that until it exactly fills the die. That gives then 188 the precise weight and the exact size, as shown here, which is 3/26″ diameter or 3/1000 larger in diameter than before, and 500/1000 in length. The thing that they do not do here and that we do in our work is that there is no positive provision made for the position in which they confine the work in the die. It may be a way over on one side or the other side, and they do not care, because they are going to fill up the hole anyway. In our instance, unless we are exactly in the right position in the die, we fail to make the part we are trying to make. This Holden patent is similar to filling holes with lead, and other things, and is a device that is not operative; it is just what you might call a laboratory device for making plugs for instruments, or something like that. It was produced "for the manufacture of copper cylinders, such as are employed in crusher gauges for registering the pressure developed in ordnance and for arms generally." Beginning with line 92, the patent says, "The next and final step in the process is to soften the copper cylinders," and this is effected by heating them in a furnace, and so on. They have their rod of copper; then they make up these devices, these little pieces, by giving them a heat treatment in the neighborhood of 1,000 degrees and form them up to this shape.

Then they are taken, half of them, and put on a testing machine under compression, and they will determine exactly what the amount of pressure is that is necessary to
189 shorten this from one-half inch in length to ten thousandths shorter, 20, 30, 40 and so forth; then when they put the balance of them in the gun and the gun is fired, they take the plug out and they can measure that, and if it is so much shorter than it was before firing, it seems there was so much force used to make it so much shorter.

That requires extreme precision in the instrument. Such instruments are not used very often,—only when the experts in ordnance are testing an instrument with a view to making or modifying their design for repetition in other instruments, in comparison with other things. I have used devices of this character in metallurgical work. It is commonly used in testing work. Those things are used two or three times a year. This Holden device is really an instrument of precision. It is not a thing that goes into service in any way. It is not a thing that is made and sold for general purposes. It is used by scientific men only, engineers. There is nothing that I know of about the patent that would be helpful to a person who wants to make roller bearings. Everything that is in that is I would say common knowledge.

Cross-examination:

Referring to the Wellman patent for forging car wheels I stated that this was used for hot forging. I do not know that I can answer that question as to what is the
190 basis for that in the specification; but I know that is what it is done for. It must be there. If a piece of cold steel metal, as shown in figures 6 or 7 of the Wellman patent were put into this design, that would not operate successfully, because you could not deform it to that extent cold.

As for the round openings in the ends of the dies of the Wellman patent, they would guide those centering devices in their position in the end of the axle to the extent that the little collar there fits the opening, the eccentric to that extent, and also, if you will notice, the thing swivels and, to the extent of that opening, it could twist around. That is what we call a not completely guided center.

In regard to the Griffin patent No. 703,405, figure 12, as to outline and form, represents a conical roller bearing roller.

Plaintiffs then introduced a stipulation of counsel as follows:

"It is hereby stipulated and agreed that William E. Umstattd, of The Timken Roller Bearing Company, Canton, Ohio, if recalled as a witness and Richard L. Wilcox, of Waterbury Farrel Foundry and Machine Company, of Waterbury, Connecticut, manufacturers of upsetting machinery or headers, if called and sworn as a witness, both present in Court at the hearing of said cause, would both testify substantially in accord with the rebuttal testimony of Marcus T. Lothrop."

The foregoing statement of evidence approved this 22 day of September, 1930.

WENDELL P. STAFFORD,
Judge.

191 Receipt of copy of statement of evidence acknowledged, statement approved and issue of citation waived this 17 day of July, 1930.

T. A. HOSTETLER,
Attorney for Thomas E. Robertson,
Commissioner of Patents.

Indorsed on cover: District of Columbia Supreme Court. No. 5300. Marcus T. Lothrop, and The Timken Roller Bearing Company, Appellants, vs. Thomas E. Robertson, Commissioner of Patents. Court of Appeals, District of Columbia. Filed Sep. 22, 1930. Henry W. Hodges, Clerk.

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COURT OF APPEALS
DISTRICT OF COLUMBIA
FILED

FEB 10 1932

Henry W. Hodges
CLERK

IN THE

Court of Appeals of the District of Columbia

MARCUS T. LOTHROP and THE TIMKEN ROLLER BEARING COMPANY,
Appellants,
vs.
THOMAS E. ROBERTSON,
Commissioner of Patents.

No. 5,300

APPELLANTS' MEMORANDUM CONCERNING RES ADJUDICATA

JAMES A. CARR,
JOSEPH J. GRAVELY,
SAMUEL HERRICK,
For Appellants.

TRIANGLE COMPOSITION CO., ST. LOUIS

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APPELLANTS' MEMORANDUM CONCERNING RES ADJUDICATA

This memorandum undertakes to show that the doctrine of res adjudicata is inapplicable to the present case. The main facts are these:

1. This case is not an appeal from the Patent Office but a proceeding which originated by bill in equity under Sec. 4915, as amended, of the U. S. Revised Statutes.

2. Res adjudicata was not pleaded in the Court below.

3. No evidence was offered or admitted on the question of res adjudicata. Not a scrap of the interference proceedings was offered in evidence.

4. The only interference ever "declared" went off on the ground that the adverse party did not disclose and had no right to claim appellant's invention. No evidence was taken, no award of priority was made, and the patentability of the subject matter was not questioned in said interference.

5. A second interference was proposed but never declared; and the proceeding preparatory to the proposed interference was ex parte and not inter partes. Appellants always contended that the subject matter of the proposed interference was not patentable and only made the claim involved therein "under protest." This proposed interference came to naught on the holding that French patent to Renault constituted a "statutory bar" against appellant. Of course, as this second interference was never instituted, no evidence was taken and no award of priority made therein.

6. The Bock application and the Lothrop application did not contain any matter in common that was patentable or that could have properly constituted the subject matter of an interference between them. Neither application contains any patentable claim that is applicable to the other application. Lothrop's product cannot be made by the Bock process and the Bock product cannot be made by the Lothrop process.

7. Both the actual interference and the proposed interference between the Lothrop and Bock applications were limited to the matter of "process." Lothrop application Serial No. 530,643 was not involved in either the actual or the proposed interference. The claims of said application 530,643 were all directed to a specific roller which was not disclosed in the Bock application, and not a single one of those claims could have been brought into any interference with Bock because none of Lothrop's claims are applicable to Bock's disclosure and Bock had no basis for making any of Lothrop's article claims. As stated above, Bock's article could not be produced by the Lothrop process and Lothrop's article could not be produced by the Bock process.

POINTS AND AUTHORITIES.

I.

Res Adjudicata Must Be Pleaded.

"Upon this the doctrine of res judicata is invoked to uphold the judgment. A sufficient answer is that neither by pleadings nor evidence were the proceedings in this other case brought before the Court of Claims in the present suit. If a party neither pleads nor proves what has been decided by a Court of competent jurisdiction in some other case between himself and his antagonist, he cannot insist upon the benefit of res judicata, and this although such prior judgment may have been rendered by the same Court. Southern Pacific Railroad v. United States, 168 U. S. 1, suggests nothing contrary to this, for there the prior judgment was offered in evidence, and the only question considered and decided by this Court was the effect of an alleged failure to fully plead res judicata."

United States v. Bliss, 172 U. S. 326.

"It is now contended that the existence of this prior decree ousted the jurisdiction of the State Court. Indeed the only object of Mrs. Bryar in endeavoring to have the appeal dismissed seems to have been to reinstate the original decree in her favor more effectually, and to insist that it was a final disposition of the matters in controversy between herself and Campbell. The question is whether, having abandoned the original decree for a new action in the State Court in which she was defeated, her heirs can now claim that the original decree in the District Court, though not set up as a bar by either party, and notwithstanding the appeal, can be resuscitated after a lapse of sixteen years for the purpose of defeating the action of the State Court. To state this proposition is to answer it. The State Court was at liberty to proceed to dispose of the case upon the issues made by the parties, and as neither party saw fit to set up the former decree as a bar to the action, the State Court was not bound to notice it. It did not affect in any way the jurisdiction of that Court. In addition to this, however, Campbell relied upon a wholly different defense from that set up by him in the former suit, and one which had accrued to him after the decree in that Court was rendered. Whether the decree, if properly pleaded, would have operated as a bar it is unnecessary to determine. As the same issues are presented here as were presented in the State Court, it is entirely clear that they cannot be relitigated."

Bryar v. Campbell, 177 U. S. 654.

II.

Res adjudicata is not a good defense unless the former adjudication determined the merits of the matter in controversy (the "merits" of an interference proceeding being priority of invention).

"Unless the Court, in rendering the former judgment, was called upon to determine the merits, the judgment is never a complete bar; and it is safe to add, that, if the trial went off on a technical defect, or because the debt was not yet due, or because the Court had not jurisdiction, or because of a temporary disability of the plaintiff or the like, the judgment will be no bar to a future action."

Cromwell v. County of Sac, 94 U. S. 365.

"There are undoubtedly many cases where final judgment upon a demurrer will not conclude as to a future action. The demurrer may go to the form of the action, to a defect of pleading or to the jurisdiction of the Court. In all such instances, the judgment thereon will not preclude future litigation on the merits of the controversy in a Court of competent jurisdiction upon proper pleadings. And it has been held that where a demurrer goes both to defects of form and also to the merits, a judgment thereon, not designating between the two grounds, will be presumed to rest on the former."

Bissell v. Spring Valley Township, 124 U. S. 232.

"There was no judgment of priority in the Dyson interference in favor of Goodrum against Martin; consequently, there can be no estoppel by judgment.

"Assuming that Martin should have moved under Rule 109 his failure to do so is not shown to have resulted in injury to any one; therefore, one of the elements necessary to an estoppel is absent."

In Re Martin, 48 App. D. C., 187, C. D. 1918 p. 215.

"Our decision in In re Martin (C. D. 1918, 213; 257 O. G. 408; 48 App. D. C. 187) in no wise conflicts with anything we have said here. It was there held that since there was not judgment of priority against Martin he could not be said to be estopped by judgment. Here there was a decision of priority against Dement and in favor of Hopkins, and it is that decision which bars him from relitigating the questions there involved, or which might have been presented if he had filed his motion in time."

In re Dement, 49 App. D. C. 261; C. D. 1920, p. 173.

"As to the estoppel, the Court in the first case dismissed the bill without prejudice. This was done for the express purpose of permitting further litigation of the same questions. This being so, neither party can either plead the decree as an adjudication, or use it as evidence of estoppel. Estoppels are mutual; if one party is not bound the other can not be. Hence the argument of plaintiff's attorney that the decree in the first case sustained the validity of the patent cannot be considered. A judgment or decree without prejudice never works estoppel or adjudicates the res. Not only was this so decided in plaintiff's favor in the second case (see 135 Fed. 694), but so are the authorities. Durant v. Essex Co., 7 Wall. 107, 19 L. Ed. 154; Mobile County v. Kimball, 102 U. S. 705, 26 L. Ed. 238; Story, Eq. Pl. Paragraph 793; 1 Dan Ch. Pr. 659; Beach, Eq. Pr. Paragraph 643; O'Keefe v. Irvington, etc., Co., 87 Md. 196; 39 Atl. 428; Taylor v. Slater, 21 R. I. 104, 41 Atl. 1001; Seamster v. Blackstock, 83 Va. 232, 2 S. E. 36, 5 Am. St. Rep. 262; Burton v. Burton, 58 Vt. 414, 5 Atl. 281; Newberry v. Ruffin, 102 Va. 73, 45 S. E. 733; Cochran v. Couper, 2 Del. Ch. 27; Lang's Heirs v. Waring, 25 Ala. 625, 60 Am. Dec. 533; Richards v. L. S. & M. S. Ry. Co., 124 Ill. 516, 16 N. E. 909; Bates v. Skidmore, 170 Ill. 233, 48 N. E. 962; Bigelow v. Winsor, 67 Mass. 229, 301; Epstein v. Ferst, 35 Fla. 510, 17 South. 455; Hazen v. Lyndonville Bank, 70 Vt. 550, 41 Atl. 1043, 67 Am. St. Rep. 680."

Robinson v. American Car & Foundry Co., 142 Fed. 171.

"It is well settled that a decree or judgment in a suit between certain parties is a bar or estoppel to the prosecution of a second action upon the same claim or demand between the same parties, or their privies, if rendered upon the merits. If not rendered on the merits, it is no bar or estoppel. In such case such prior decree or judgment is a finality as to such claim or demand in controversy, concluding parties and those in privity with them, not only as to every matter which was offered and received to sustain or defeat the claim or demand, but as to any other admissible matter which might have been offered for that purpose. But the judgment or decree must have been rendered upon the merits. Cromwell v. County of Sac, 94 U. S. 351, 352, 24 L. Ed. 195; Hughes v. United States, 4 Wall. (U. S.) 232-237, 18 L. Ed. 303; Gould v. E. etc. R. R. Co., 91 U. S. 532, 533, 534, 23 L. Ed. 416; U. S. v. C. B. W. R. Co. (C. C.) 110 Fed. 864; Russell v. Place, 94 U. S. 606; 24 L. Ed. 214;

Clark v. Bernhard M. Co. (C. C.) 82 Fed. 339; Shaw v. Broadbent, 129 N. Y. 114-123, 29 N. E. 238; Ward v. Boyce, 152 N. Y. 191, 201, 46 N. E. 180, 36 L. R. A. 549; Foye v. Patch, 132 Mass. 105-110. The rule is well stated in Hughes v. United States, 4 Wall, at page 237 (18 L. Ed. 303) where it is said:

> ‘In order that a judgment may constitute a bar to another suit, it must be rendered in a proceeding between the same parties or their privies. and the point of controversy must be the same in both cases, and must be determined on its merits.’

“In Shaw v. Broadbent, 129 N. Y., at page 123, and 29 N. E., at page 240, the Court said:

> ‘In order that a judgment should have the effect claimed, it is not enough that the party produces a record showing a judicial determination of the same question litigated in his favor, but it must also appear that it was rendered upon the merits, upon a material point.’ ” etc.

> United States Fastener Co. v. Bradley, 143 Fed. 523.

III.

Res adjudicata is inapplicable unless the prior adjudication actually determined or afforded opportunity for determining the same matter that is involved in the later case; if the two applications do not disclose the same patentable invention, there can be no interference and, consequently, there could be no opportunity for an adjudication on the merits.

"The question for determination is whether the second interference related to substantially the same cause of action as the prior interference."

Cross v. Rusby, 42 App. D. C. 341, C. D. 1914, 213.

"The judgment or decree in the former case is not conclusive in the later one as to matters which might have been decided, but only to those which were in fact decided. (Cromwell v. Sac Co., 94 U. S. 351, 353; Last Chance Mining Co. v. Tyler Mining Co., 157 U. S. 683, 687.) The issue of the estoppel is that there has been a judicial determination of the fact; and this includes every fact put in issue, and necessary to the judgment or decree, whether expressly recited therein or not."

Horine v. Wende, 29 App. D. C. 415, 1907 C. D. 621.

"It will be observed that the claim here made is totally different from the issue involved in the interference. It is not an attempt to broaden the scope of the former claim, as in Blackford v. Wilder (C. D. 1907, 491; 127 O. G., 1255; 28 App. D. C. 535) and other cases cited by the tribunals below and by counsel for the Government. The real test here is whether or not the granting of these claims to Curtiss would dominate the subject-matter upon which Janin prevailed in the interference. If so, the claims should be denied.

* * * * * * *

"There are compelling reasons why the rule of estoppel by judgment should not be applied with the same severity in interference proceedings in the Patent Office as in cases at law and equity.

* * * * * * *

"Though relating to the same structure, the specific claim found to have been made in the former case was for a different invention than that here involved; and, the cause of action being different, we are of opinion that appellant is not estopped to make the claims of the present issue."

> In Re Curtiss, 46 App. D. C. 183; 1917 C. D. p. 145.

The doctrine of this Curtiss case was recognized in a later case as follows:

> "In that case (in re Curtiss) we held the causes of action were different, but here the cause of action is the same in both cases."

> In re Cutler, 48 App. D. C. 444, 1919, C. D. p. 191.

"As to the first proposition, there can be no doubt that the prior adjudication is res adjudicata as to all questions put in issue and determined there. But this abstract statement is not determinative of the question propounded, because in the prior interference there was involved the question of Dyson's diligence from about the middle of February of 1906 to the middle of May of that year. In the present interference, however, if Dyson was diligent just prior to

May 20th he must prevail, unless the second proposition advanced by Fish is sound."

Fish v. Dyson, 55 App. D. C. 209; 1925 C. D. 286.

"Private right and public welfare unite in demanding that a question once adjudicated by a Court of competent jurisdiction shall, except in direct proceedings to review, be considered as finally settled and conclusive upon the parties. *Interest reipublicae ut sit finis litium.* But in order to make this finality rightful it should appear that the question was distinctly put in issue; that the parties presented their evidence, or at least had an opportunity to present it, and that the question was decided."

Fayerweather v. Ritch, 195 U. S. 299.

"As between the parties, the decision is an estoppel by judgment only so far as it goes. Since Deitsch did not claim for the recessed shoulder, the decision has no force here."

Muther, et al., v. United Shoe Machinery Corporation, 7 Fed. Rep. (2d) 959.

IV.

The doctrine of res adjudicata by reason of proceedings in the Patent Office are not applicable in proceedings by bill in equity under Section 4915, which contemplates that the entire proceeding shall be de novo.

"It is true that the decision in Davis v. Garrett is not final in the sense that it is a complete settlement of the right to the patent. The losing party has the right to proceed in equity under section 4915, Revised Statutes, and the decision in the former case is not res adjudicata. (Morgan v. Daniels, C. D., 1894, 285; 67 O. G., 811; 153 U. S. 120.) But while the proceeding is in the Patent Office that decree is final in so far as proceedings in the Patent Office are concerned. (Butterworth v. Hoe, C. D. 1884, 429; 29 O. G., 615; 112 U. S. 50.)

"The judgment was certified to the Commissioner and governs further proceedings in the Patent Office. For that reason the doctrine of res adjudicata has been upheld in the Patent Office in many cases. (Blackford v. Wilder, C. D. 1907, 491, 127 O. G. 1255, 28 App. D. C. 535; Horine v. Wende, C. D. 1907, 615, 129 O. G. 2858, 29 App. D. C. 415; in re Edison, C. D. 1908, 327, 133 O. G. 1190, 30 App. D. C. 321; Newcomb Motor Co. v. Moore, C. D. 1908, 332, 133 O. G. 1680, 30 App. D. C. 464; Carroll v. Hallwood, C. D. 1908, 444, 135 O. G. 896, 31 App. D. C. 165; New Departure Manufacturing Co. v. Robinson, C. D. 1913, 332, 188 O. G. 1055, 39 App. D. C. 504; Sutton v. Wentworth, C. D. 1914, 210, 204 O. G. 320, 41 App. D. C. 582.)

"It appears in the evidence that there is a suit pending in the United States District Court for the District of New Jersey, instituted by Davis, the party to Davis v. Garrett, to compel the issue of the patent that was refused in the Patent Office in Davis v. Garrett. This suit was brought under section 4915, Revised Statutes, and it is expressly provided for in that section, but does not take away the finality of the judgment in Davis v. Garrett in so far as proceedings in interference are concerned. If successful, it will have the effect to set aside the former award of priority to Garrett and require issue of the patent to Davis. This is the express object of the section."

McKenzie v. Garrett, 43 App. D. C. 6; 1915 C. D. 85.

"There is no final judgment of this Court rendered in such cases, nor is there any such judgment required or authorized to be rendered, not even for costs of the appeal. This Court is simply required in such cases, after hearing and deciding the points as presented, instead of entering judgment here, to return to the Commissioner of Patents a certificate of the proceedings and decision of this Court, to be entered of record in the Patent Office, to govern the further proceedings in the case. But it is declared by the statute that no opinion of this Court in any such case shall preclude any person interested from the right to contest the validity of any patent that may be granted by the Commissioner of Patents. Rev. Stat., paragraphs 780, 4914."

Rousseau v. Browne, 21 App. D. C. 73.
Butterworth v. Hoe, 112 U. S. 50.
Frasch v. Moore, 211 U. S. 9.
Johnson v. Mueser, 212 U. S. 283.

The Lothrop-Bock Interference.

The term "interference" does not designate a state of facts but a quasi-judical proceeding authorized by Section 4904 United States Revised Statutes for the sole purpose of determining the question of priority of invention as between two or more applicants who describe and claim the same patentable invention.

The Patent Office Rules of Practice contain the following pertinent provisions:

> "Rule 93—An interference is a proceeding instituted for the purpose of determining the question of priority of invention between two or more parties claiming substantially the same patentable invention * * *."
>
> "Rule 94—Interferences will be declared between applications by different parties for patent or for reissue when such applications contain claims for substantially the same invention which are allowable in the application of each party. * * *"
>
> "Rule 95—Before the declaration of interference * * * the invention which is to form the subject of the controversy must have been patented to one of the parties or have been decided to be patentable. * * *"
>
> "Rule 100—The primary examiner will retain jurisdiction of the case until the declaration of interference is made."
>
> "Rule 101—Upon the institution and declaration of the interference, as provided in rule 102, the examiner of interferences will take jurisdic-

> tion of the same, which will then become a contested case."

> "Rule 102—When the notices of interference are in proper form, the examiner of interferences * * * shall, pro forma, institute and declare the interference by forwarding the notices to the several parties to the proceeding."

The fact that stands out most conspicuously in these rules is that there is no interference unless the subject of the controversy is a patentable invention. As far back as 1849, in a case involving the Morse telegraph, the Court said "the question is not now whether the claims of Mr. Bain and Mr. Morse interfere as to matters not now patentable; but whether they interfere as to matters now patentable" (Bain v. Morse, Western Law Journal 372).

The set form used by the Patent Office in declaring an interference is:

> "The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules * * * The subject-matter involved in the interference is," etc.

This judgment constitutes the "opinion" of Section 4904 and the "declarations" of the Rules; and no matter how clearly the claims of one applicant may conflict with the claims of another applicant, there is no "interference" until it is initiated by formal judgment or "declaration." It is this judgment or "declaration" that changes the status of the case from an ex parte application to an inter partes contest.

In the course of the prosecution of the Lothrop application, it was adjudged to interfere with an application of one Bock, who had copied three of Lothrop's claims. These three claims constituted the three and only issues or subject-matter of the interference.

Lothrop moved to dissolve the interference on the ground that Bock did not disclose the subject-matter of the interference and, therefore, could not make claim thereto. This motion was sustained and the interference dissolved on the score that Bock did not disclose the invention. Neither party challenged the patentability of the subject-matter of the interference.

It is submitted that on this state of facts, there are none of the elements of estoppel or res adjudicata against Lothrop; for the subject-matter of the interference originated in the Lothrop application as claims for Lothrop's invention, and the effect of sustaining Lothrop's motion to dissolve was to decide that the interference was improvidently declared because the subject-matter of the Bock application was not the same as that of the Lothrop application. The only question for decision on said motion was whether the Bock application disclosed the same invention as the Lothrop application; and the decision was adverse to Bock and favorable to Lothrop. That decision dissolved the interference and the same was never "redeclared."

The proposed second interference was not an inter partes controversy.

Rule 109 of the Patent Office reads:

> "An applicant involved in an interference may, * * * file an amendment to his application containing any claims which, in his opinion should be made the basis of interference between himself and any of the other parties * * *. On the admission of such amendment and the adoption of the claims by the other parties within a time specified by the examiner of interferences the primary examiner shall redeclare the interference or shall declare such other interferences as may be necessary to include said claims. New preliminary statements will be received as to the added claims," etc.

While the original interference was still pending, Bock filed an amendment containing three new claims couched in the language of the original issues except that the word "upsetting" was changed to the very much broader term "forging." Lothrop opposed the admission of such amendment on the score that the claims were so very broad as to be anticipated by the Lockwood patent discussed in our main brief and, therefore, unpatentable. Bock's motion for leave to amend was granted, whereupon Lothrop adopted the amended claims with a formal protest (Transcript p. 66) that they were not patentable.

It is to be noted that at this time the Lothrop application and the Bock application were both ex parte cases, the inter partes contest having been terminated by the dissolution of the interference. At this stage, the Primary Examiner called the Law Examiner's attention to two foreign patents which, in his opinion, constituted a statutory bar to the patentability of such broad claims. One of these patents was a Swedish patent that is of no interest, because, among other reasons, it is too recent to be effective The other citation was the French patent of Renault that is preserved in the transcript and discussed in the briefs. The outcome of the matter was that the Law Examiner decided that the French patent of Renault constituted a "statutory bar" to the grant of a patent to Lothrop for the three broad claims which he had adopted with a formal protest at the time against the patentability thereof. The proposed second interference, therefore, was never "declared" and, of course, there were no proceedings, testimony or adjudication therein.

Upon this state of facts it is submitted that precedents involving adjudications of priority of invention in interferences are not at all relevant to the ex parte conditions prevailing at the time when the Law Examiner held the French patent to constitute a statutory bar to Lothrop for the broad subject-matter of the proposed interference.

Lothrop Had No Opportunity to Offer Evidence in the Patent Office.

The doctrine of res adjudicata never applies unless the litigant had an opportunity to offer evidence in support of his contention. The only issue in an interference is priority of invention; and, as the Lothrop-Bock interference went off on motion to dissolve, there was no opportunity for either party to offer any evidence. From what is said elsewhere in this memorandum, it is readily inferable that Lothrop was in position to prove that the Bock process was impractical and inoperative and amounted to nothing more than an abandoned experiment, followed later by the abandonment of the Bock application. That the Bock process never came into use is implied from one statement in the testimony, namely: "everybody who is manufacturing rolls now-a-days makes them with buttons, with the exception of ourselves" (Transcript p. 118). Besides, the Lothrop invention dates back to 1916, prior to the date of filing of the Bock application. If there had been an interference in fact between the two applications, Lothrop would have been given an opportunity to introduce evidence; but in the absence of an interference in fact and an opportunity to introduce evidence, there can be no res adjudicata.

None of the Product Claims Were Involved in Interference.

The subject matter of the actual interference and the subject matter of the proposed interference was a **process** which depended for patentability upon certain operations under specified conditions. So far as the patentability of such process is concerned, it is a matter of indifference whether the resultant article or product is new and patentable or not. Consequently, it is submitted that, as the article or product forms no part of the subject matter of either the actual or the proposed interference, the doctrine of res adjudicata is entirely inapplicable to claims for such product.

As a matter of fact, the Bock product is a roller with a taper body portion and an enlarged head that is much wider than such taper body portion; whereas the Lothrop roller tapers continuously from end to end and comprises distinctive features of great functional importance. By reason of these special features, the product can be made without any appreciable flash or fin where the die members come together; and if such a fin should occur, it would be at the edge of the roll, beyond the bearing surface thereof and could, therefore, be left or removed without injury to such bearing surface. Another functional feature is the formation of the centering recesses in both ends of the rolls that are located as perfectly concentric with the bearing surface as the precise art of die making makes possible, such recesses being shaped and positioned for co-operation with the centering dies of a grinding machine or other finishing machine. For like reasons, the thrust bearing band is accurately and concentrically die-formed on the end of the roller within the peripheral surface and adequately supported away from the edge of the roll. Again, by reason of the location and formation of such recesses and thrust bearing band, the green rollers pass through heat treatment unscathed by the distorting effects usually incident to such treatment. All of these features enter into Lothrop's claims for the product; and not a single one of them is found in the headed roller of Bock.

On this summary, it is submitted that the Bock product lacks every feature that patentably distinguishes Lothrop's product from the prior art. In other words, Lothrop's product and Bock's product are not the same invention; none of Lothrop's claims are applicable to the Bock product; and the disclosure of the Bock application is thoroughly insufficient to form a basis for making any of Lothrop's claims. Under such conditions, there is no patentable matter whatsoever common to the two applications.

Again it is noted that Lothrop's application for the product had been filed before the declaration of interference between Lothrop's process application and the Bock process application; and if said Lothrop's product contained any patentable subject matter which was also disclosed in the Bock application, such common matter ought to have been suggested by the Patent Office to Bock just as it suggested Lothrop's process claims. The fact that no such suggestion was made and that neither the actual interference nor the proposed interference contained any claims for the product argues strongly against there being any patentable matter common to the two applications. As there never was any interference proceeding in regard to any product, there cannot be any estoppel in respect of claims for the product.

The Lothrop Process and the Bock Process Are Essentially Different.

In the Lothrop process, one end of the slug is first solidly seated against the fixed bottom of the die and then the entire slug is spread laterally against the side wall of the die as the result of internal stresses caused by the pressure on the outer end of the slug and completely resisted by the rigid bottom of the die. As the flow of the metal endwise is blocked by the bottom of the die, such metal is forced to flow laterally outward until it bears against and takes the form of such die. This outward lateral movement of the metal is limited by the solid resistance of the wall of the die; and, on account of the taper die being narrowed at its bottom, the lateral flow of the metal at the bottom of the slug ceases while the rest of the metal is still free to flow laterally. Thus the point of cessation of lateral flow rises continuously until the metal at the top of the slug reaches the side wall of the die. In a way, although the movement of the metal is laterally outward, the progressive increase of its contact with the wall of the die may be likened to that of cold molasses rolling up the side of a glass into which it is poured.

Lothrop's operation of upsetting the metal changes the shape of the slug but not its volume, the length of the original slug being shortened by an amount required to compensate for increase in thickness. The longitudinal flow of metal occasioned by the shortening of the slug is not evenly distributed lengthwise of the slug but, at each point in its length, is proportional to the extent of spreading. Thus, at the narrow end of the die, the longitudinal movement of the metal, after the slug is rigidly seated against the bottom of the die, is practically nil; and from this narrow end upward, the longitudinal flow of the metal in the slug, required to compensate for outward lateral flow, increases continuously. Wherever and as soon as the lateral flow of the metal produces contact with the wall of the die, both lateral and longitudinal flow cease. Consequently, after the slug is once firmly seated in the die, there is never any sliding of any portion of the slug in contact with the wall of the die; and, consequently, there is no loss of power due to frictional contact and no abrasion of the die and no tendency to tear the metal.

In the Bock process, the operation of forming the body of the roll and the operation of forming the head of the roll are very different from each other. Although the head is an essential part of the Bock roller and greatly complicates his problem, we may here disregard this head for the sake of simplicity.

In forming the body of the roll, Bock proposes to start with a slug of such thickness that it barely enters the large end of a tapered die. The Bock process contemplates that the slug will contact with the wall of the die and be forced to move endwise of the die while in contact therewith. The theory of the process is that the end of the slug must be free to move and that the reaction of the side of the die against the slug will force the metal to flow inwardly and endwise, thereby narrowing and elongating the slug. At the beginning of the operation, relatively little internal work in the slug is required to taper the end of the slug; but as more and more surface of the slug contacts with the wall of the die, more and more power and internal work in the slug are required. The tip of the slug undergoes continuous plastic flow throughout its movement from the top of the die to the bottom thereof; and in the final stage of the operation, there is plastic flow throughout every portion of the slug.

With this brief statement, the two processes may be compared as follows. Lothrop's upsetting process required the end of the slug to be seated against a rigid bottom, whereas the end of the Bock slug must be free to move. Lothrop's slug must be thinner than the die, whereas the Bock slug must be thicker than the die. Lothrop's product is shorter than his slug, whereas Bock's product is longer than the slug.

The lateral flow of metal in the Lothrop process under the pressure of the plunger is outwardly and due to the reaction against the bottom of the die; whereas the lateral flow of metal in the Bock process is inwardly and due to the reaction of the wall of the die. In the Lothrop process, the forward portion of the slug, which requires the least work, is wholly disposed of early in the operation so that the energy is concentrated later on the portion requiring the greatest amount of internal work; whereas, in the Bock process, no portion of the work is disposed of so as to release energy for later portions of the work but on the contrary the work continues to increase enormously with the progress of the operation. In the Lothrop process, there is never any sliding of the slug or any portion thereof in contact with the wall of the die; whereas the whole theory of the Bock process centers on such sliding of the slug along and in contact with the wall of the die. In the Lothrop process, the entire energy is effective in producing the plastic flow of metal required to change the shape of the slug, with the die functioning merely as a limit or form therefor; whereas, in the Bock process, a very large proportion of the energy is wasted in overcoming the excessive frictional resistance between the slug and the wall of the die, on which the die slides with the die performing the important function of a reaction member.

We have not hereinbefore compared the Lothrop process with the complete Bock process but, for the sake of simplicity, have disregarded the head of the

Bock roller and limited the comparison to the tapered body portion of the Bock roller. The making of the head, however, complicates the problem greatly and cannot properly be ignored. If it is assumed that the formation of the head is nothing more than the common operation of heading bolts, it is obvious that it can not be done until after formation of the body portion is completed. Otherwise, the head will be at least partially severed from the body. Again, there is a limit to the extent that steel can be made to spread by plastic flow without rupturing; and if the body of Bock's roll is made by the Lothrop process, that is, by spreading instead of narrowing, it is entirely unlikely that the metal could be spread still further to form the head without rupturing. Still, the Bock problem required the production of a roller with a head wider than its body; and the process is impractical and inoperative, if it can not produce a useful product. In some respects, the Lothrop upsetting operation is the reverse of Bock's extrusion operation; but in other respects, they are entirely unlike. However, this may be, it is clear that Lothrop's operation produces a practical product, whereas Bock's extrusion operation is only one element of his process and leaves the work in a wholly unfinished condition.

The Cases Cited by Appellee Are Inapplicable to the Present Case.

Appellee's brief cites the following decisions of this Court on res adjudicata:

> In re Marconi, 38 App. D. C. 286, 1912 C. D. 483.
>
> In re Capen, 43 App. D. C. 342, 1915 C. D. 115.
>
> In re Doble, 57 App. D. C. 10, 1927 C. D. 101.
>
> In re Austin, 40 Fed. (2d) 756, 1930 C. D. 505.

All of these cases came before this Court on direct appeal from the Patent Office, whereas the present case originated in a bill in equity under Sec. 4915 as amended; and this Court has limited the application of res adjudicata to proceedings in the Patent Office and has denied its application to proceedings under Sec. 4915.

The Marconi case is further discriminated from the present case, first, by the fact that there had been an interference that had determined on the question of priority of invention; second, that such decision was adverse to Marconi; and third, that the later claims of Marconi were broader than those involved in the interference and would therefore dominate the claims of the successful party; whereas, in the Lothrop-Bock interference, there was no award of priority, the denial of Bock's right to make the claims was favorable to Lothrop, and the claims now in controversy are all narrower than the interference issue and do not touch anything disclosed in the Bock application.

In the Capen case, there had been an interference which went off on motion to dissolve on the score that Count 4 was unpatentable and that Capen was not entitled to make the other counts. This decision was affirmed on successive appeals, after which Capen presented new and broader claims than those involved in the interference. The present case is distinguished from Capen, first, because in the Lothrop-Bock interference, the issues originated in the Lothrop application and it was Lothrop's adversary who was held not to be entitled to make Lothrop's claims; second, because the claims now in controversy are narrower than the interference issues; and third, because the present claims cover matter that is not disclosed in the Bock application and could not have been brought into interference with Bock.

In the Doble case, there had been an interference which had been dissolved on Doble's motion on the score that his adversary had no right to make the two claims of the issue. Doble's adversary canceled the claims corresponding to the issue and was granted a patent for the remaining claims. Doble, the successful party, copied the claims from said patent and asked for a second interference, which was denied. The Doble case fell squarely within the wording of Rule 109 of the Patent Office. The Lothrop-Bock interference is discriminated from the Doble case by the fact that in addition to the subject-matter of the Doble interference, there was other patentable matter common to the two applications but not involved in said interference, that the belated claims made by

Doble were copied from a patent granted on his adversary's application; and said claims were not made until ten months after the dissolution of the interference; whereas, in the Lothrop-Bock interference, there was no patentable matter common to the two applications, and the Lothrop claims do not cover anything disclosed in the Bock application and could not have been brought into interference with Bock; and there was no delay in making said claims.

The Austin case was decided mainly on the policy and binding force of Rule 109 of the Patent Office. An interference involving patentable matter went to judgment of priority adverse to an application owned by Austin's assignee. Eight months after the time allowed by Rule 109, the common assignee sought to bring the Austin application into the interference. It was held that the common assignee was an "applicant" within the meaning of Rule 109 and as such was required to bring into the interference, within a reasonable time, whatever patentable matter there might be in any of its applications, which it desired to contest with the opposing party.

The present case is distinguished from the Austin case, first, because in the Lothrop-Bock interference, it was held that Bock did not disclose the subject-matter thereof, which necessarily implies that he did not disclose Lothrop's still narrower claims; and second, because there is no patentable matter common to the Lothrop and Bock application; and third because none of the Lothrop claims here in question are applicable to anything in the Bock application and none of them could be made in that application.

Consequently, conceding full force to every one of said citations, it is clear that they are inapplicable to the present case. There is nothing whatsoever patentable in the Bock process, all of the claims now in controversy are narrower than the interference issues and none of them is applicable to or could be supported by the disclosure of the Bock application.

Respectfully submitted,

JAMES A. CARR,
JOSEPH J. GRAVELY,
SAMUEL HERRICK,
For Appellants.

COURT OF APPEALS,
DISTRICT OF COLUMBIA
FILED

JUL 25 1931

Henry W. Hodges
CLERK.

No. 5300

In the Court of Appeals of the District of Columbia

MARCUS T. LOTHROP AND THE TIMKEN ROLLER BEARING COMPANY, APPELLANTS,

v.

THOMAS E. ROBERTSON, COMMISSIONER OF PATENTS, APPELLEE

BRIEF FOR APPELLEE

T. A. HOSTETLER,
Attorney for Appellee.

In the Court of Appeals of the District of Columbia

No. 5300

Marcus T. Lothrop and The Timken Roller Bearing Company, appellants
v.
Thomas E. Robertson, Commissioner of Patents, appellee

BRIEF FOR APPELLEE

This is an appeal from a decree of the Supreme Court of the District of Columbia dismissing appellants' Bill of Complaint filed under the provisions of Section 4915, R. S. (35 U. C. A. 63).

As appears from the Bill of Complaint, two Lothrop applications are included in this appeal: Application No. 488260, for a Process of Making Conical Rollers, which was filed on the 28th day of July, 1921 (R. p. 3), and Application No. 530643, which was filed on the 20th day of January, 1922 (R. p. 7).

PART I. APPLICATION 488260

The application relates to a process of making conical rollers for roller bearings. The process consists in forging a substantially cylindrical slug 6 in a tapered die or dies to produce a green or unfinished roller of the size and taper desired, with depressions in the ends suitable for centering it in a grinding machine. The volume of the slug is approximately equal to the volume of the finished roller, a slight allowance being made for grinding. The slug 6 is placed in the cylindrical bore of the lower die 9 (see Fig. 2) and is swaged in the partly cylindrical and partly tapered bore of the vertically movable upper die 10 by pressure exerted by the plunger 11 of the lower die, whereby the slug is shortened endwise and spread laterally to conform to the surface of the upper die (see Fig. 3) and is converted into a blank 12. At the same time a central depression 13 is formed in the lower end of the blank by an accurately centered projection 14 on the face of the plunger 11.

This blank is then subjected to pressure in another die 19 (see Fig. 4) by means of a plunger die 15 and the knockout piece 20, having a projection 21 adapted to form a centering depression 22 on the upper end of the roller. The taper of the bores of die 15 is the same as desired for the finished product, so that the roller is forged to the desired shape. The roller is then carburized and hardened, when it is ready for grinding.

Applicant describes the swaging or forging operation as "upsetting."

The claims refer to this operation variously as "upsetting," "forging," "coining," and "shortening and thickening," the slug.

In this application appellants present for consideration claims 1 to 13, inclusive (R. pp. 3 to 6, inclusive), which also appear in connection with the Examiner's Statement on pages 62 to 68, inclusive.

The following prior patents are relied upon as anticipating the process set forth in the thirteen process claims, viz:

Wellman, 422557, Mar. 4, 1890. (R. p. 33.)
Holden, 632462, Sept. 5, 1899. (R. p. 36.)
Lockwood, 1152110, Aug. 31, 1915. (R. p. 43.)
Renault, French, 491251, May 28, 1919. R. p. 56.)
Griffin, 703405, July 1, 1902. (R. p. 40.)
Miller, 1392019, Sept. 27, 1921. (R. p. 46.)
Huther, 1402071, Jan. 3, 1922. (R. p. 51.)

The French patent 491251 (R. p. 56) is cited to show dies enclosing a cylindrical blank to compress the blank. This patent in Fig. 1 discloses a cylindrical blank or slug *l* positioned in an upwardly tapered die *a*. In the compressing operation the slug is made shorter and thickened as it fills the tapered die. It is true that Renault operates on the cylindrical blank to form a different article, but that is immaterial.

The patent to Holden (R. p. 36) also illustrates the process of cutting blanks *a*, from a rod A, which blank *a* is then upset or formed as stated in the Holden specification (R. p. 37) as follows (line 31):

> Fig. 2 represents a perforated die and two punches in the act of compressing a cylinder-blank longitudinally and expanding it laterally to give it the correct shape when finished.

The Wellman patent 422557 (R. p. 33) discloses apparatus for forging blanks as A, Fig. 1, and having dies I with plungers J that thrust forward their full throw and upset the axle to just the desired length (lines 94 et seq.).

The patent to Lockwood 1152110 (R. p. 43) discloses a process for swaging rolls by successive operations.

The Griffin patent 703405 (R. p. 40) in Fig. 12 shows a roller substantially of the form shown by appellant used in a cage of different form.

Miller 1392019 (R. p. 46) and Huther 1402071 (R. p. 51) also show tapered rollers. Huther at 17 shows tapered recesses in the ends of the rollers.

The file of Interference No. 47230, *Lothrop* v. *Bock,* is not of record in full but from the Examiner's Statement (R. p. 62) and the Board's decision in Application 488260 and from the corresponding papers in Application 530643 (R. p. 7 to R. p. 79) we obtain the essential facts of that interference as follows:

Claim 1 (R. p. 62) here involved reads as follows:

> 1. The improvement in the art of making conical rollers which consists in progressively coining a slug in a series of dies of which the last is of the size and taper desired for the roller.

This claim was count 2 of the interference except it had the word "upsetting" in the place of "coining."

Claim 2 (R. p. 62) was count 3 of the interference except it also had "upsetting" for "coining."

In the interference Lothrop (appellant here), the junior party, made a motion to dissolve on the ground that Bock could not make the claims of the issue. Bock made a motion to add counts. Both motions were granted.

The gist of Bock's new claims was the substitution of the word "forging" for the word "upsetting." In fact one of Bock's additional claims was identical with claim 1 (R. p. 62) except it had the word "forging" for "coining."

Instead of proceeding with the interference 47230 with the new counts that were held patentable by the law examiner, Lothrop appealed from the holding of patentability, but as no appeal lies from that holding (Rule 124) Lothrop's appeal was dismissed.

The primary examiner now called attention to the French patent to Renault, 491251, and a Swedish patent as anticipating the new counts. This was set for *inter partes* hearing before the law examiner. Lothrop filed a memorandum urging dissolution as illustrated by the following quotation:

> It is submitted, therefore, that the Lockwood patent, of itself, completely anticipates all of the claims proposed by Bock's motion. If it lacks anything, the French and Swedish patents cited by the examiner makes good the deficiency.

The law examiner then dissolved the interference on the Renault French patent relying also on Lockwood, 1152110.

With respect to the Renault French patent the laws examiner said:

> The French patent was published more than two years prior to the Lothrop filing date and is therefore a statutory bar against Lothrop's right to a patent for the subject matter of the proposed counts.

Both Lothrop and Bock acquiesced in the dissolution of the interference on the ground that the counts were unpatentable, as neither party appealed from that decision dissolving the interference.

Lothrop, appellant here, having thus succeeded in disposing of his senior party opponent in the interference by urging unpatentability, he is now before this Court seeking *ex parte* claims substantially the same as the counts of the interference. The claims were first "upsetting" then "forging" now "coining." It is not seen how it can be consistently urged that the word "coining" makes the claims patentable over the same art upon which "upsetting" and "forging" were held unpatentable.

Having urged strenuously in the interference that the French patent was an anticipation, it would appear inconsistent for appellant to now urge that this patent is not pertinent.

With this preliminary view of the interference, the force of the examiner's clear statement (R. p. 62 et seq.) can be better understood, particularly as set forth on page 67, as follows:

> Claims 1 and 2 are considered to be in substance the same as the proposed counts 2 and 3 of the interference, differing only in the use of the word "coining" instead of "forging." "Coining" is understood to be that form of forging in which the article forged is entirely enclosed in, and completely fills the die cavity. This is true of the French patent also. The claims are therefore rejected on the French patent for the reasons given by the Law Examiner in holding the subject matter thereof unpatentable to applicant in view of the French patent. The applicant can not now obtain in an *ex parte* proceeding what he has been denied *inter partes.*

It is not necessary to prolong this brief by again stating the grounds of rejection of the claims in Application 488260 as that has been concisely done by the Examiner in his Statement (R. p. 62 to 68) and in the Decision of the Board of Appeals (R. p. 69 to 71). The Solicitor of the Patent Office therefore respectfully requests that said statement and decision be considered as if a part of this brief.

In the case of *Model Bottling Machinery Co.* v. *Anheuser-Busch Brewing Association,* 190 F. R. 573, 579 (C. C. A.), it was urged that the patents cited in defense did not disclose all of the steps of the process claims. The Court, however, said:

> [4] It is, however, insisted upon the part of complainant that this difference in material; that slowly passing through the water bath does not imply a continuous movement. Be that as it may, it is not necessary, in determining the question of anticipation, that the process should be identical in all particulars. It is sufficient if in general aspects the two processes are the same and the difference in minor matters is only such as would suggest themselves to a person possessing ordinary skill in the art. We have no doubt that a process whereby the thing to be pasteurized slowly passed through the agency would be very suggestive of a continuous movement.
>
> [5] But it is said that these patents to Gasquet and Pindstofte were machine patents, and, being such, are impertinent as evidence of anticipation. A full and complete answer to this is that, though these patents were each for an apparatus, they fully disclosed the process, and upon the issue of the patents such process was published.

PART II. APPLICATION 530643

Now, with respect to the twenty so-called article claims for the roller in Application 530643 set forth in the Examiner's Statement (R. p. 71 et seq.) it should be noted that appellant Lothrop's rollers shown opposite page 28 of the record are essentially the same as the roller shown in Fig. 12 (R. p. 40) of the Griffin patent, or the roller *c* (R. p. 46) of the Miller patent or the tapered rollers 13 (R. p. 51) of Huther. Note that Huther says (R. p. 52) lines 61 et seq.:

> It is obvious that any other form of rolling element may be employed.

It is therefore apparent that these references anticipate any claims that appellant Lothrop may draw on his rollers as proper article claims. However, in attempting to distinguish from these references appellant Lothrop has incorporated into these 20 claims method steps that render these claims improper article claims by giving them method characteristics and therefore were held by the Examiner (R. p. 74, last paragraph) as "not properly divisible from applicant's copending process claims * * * in application No. 488262."

Do the method steps in the article claims add patentability to these claims? The answer is found in the decision of the Board of Appeals beginning at the bottom of page 78 of the record as follows:

> It remains to be determined whether the claims define a patentably new article by virtue of their reference to the method of

> manufacture. It is not new to form rollers by forging, hardening, and grinding operations. This is disclosed in the patent to Lockwood, No. 1152110. It is also old to forge articles from cylindrical slugs by upsetting the slugs endwise in dies of circular cross section, as shown in the French patent to Renault, No. 491251. Furthermore, the patent to Wellman, No. 422557, discloses apparatus for forging car axles in which endwise upsetting dies are used. These dies are provided with conical points for centering the axles for subsequent finishing operations in a lathe. All of these references are of record in appellant's companion case and were relied upon by the examiner in holding the method claims unpatentable.
>
> Forged rollers being old, as disclosed in Lockwood, we believe appellant did not exercise invention in using the old steps of metal working, disclosed in Renault and Wellman, in shaping his rollers. The case-hardening and finishing operations are disclosed in Lockwood, and since there is no patentable novelty in the particular shape appellant imparts to his rollers we find nothing in the claims which warrants their allowance.

With respect to the deposition, the most that can be said is that the personnel or engineers of the company have succeeded in devising or adjusting their machines to produce an accurate product. A careful reading of the Lothrop applications, however, is convincing that these applications do not disclose anything that is patentably new or is not already known by persons skilled in the metal-working art.

As to commercial success: large sales do not necessarily indicate invention particularly in this line because everything that goes into the manufacture of automobiles is used by the millions. Obviously other manufacturers of roller bearings must have enormous sales, otherwise they could not afford the extensive and expensive advertising that appears in numerous periodicals.

The amount of saving of material and labor over the screw machine process is interesting but it should be noted that the screw method is not the only other method as appears from the patent to Lockwood, 1152110 (R. p. 43), which was urged so strenuously as a reference in the interference proceeding.

In conclusion it is respectfully submitted that the Decree of the Court below dismissing the bill is correct and should be affirmed.

T. A. Hostetler,
Solicitor of the Patent Office.

July 15. 1931.

The following decisions are believed to be pertinent and are cited for consideration at the hearing, viz:

In re Doble, 57 App. D.C. 10; 1927 C.D. 101.

In re Austin, 40 F. (2d) 756; 1930 C.D. 505.

In re Capen, 43 App. D.C. 342; 1915 C.D. 115.

In re Marconi, 38 App. D.C. 286; 1912 C.D. 483.